THE SCHOOL OF POSTGRADUATE STUDIES







THE FEDERAL UNIVERSITY OF TECHNOLOGY,
AKURE, ONDO STATE, NIGERIA

PROSPECTUS

2025 - 2030

A
PROSPECTUS

OF

THE SCHOOL OF POST GRADUATE STUDIES
2025-2030

FEDERAL UNIVERSITY OF TECHNOLOGY
AKURE, ONDO STATE, NIGERIA



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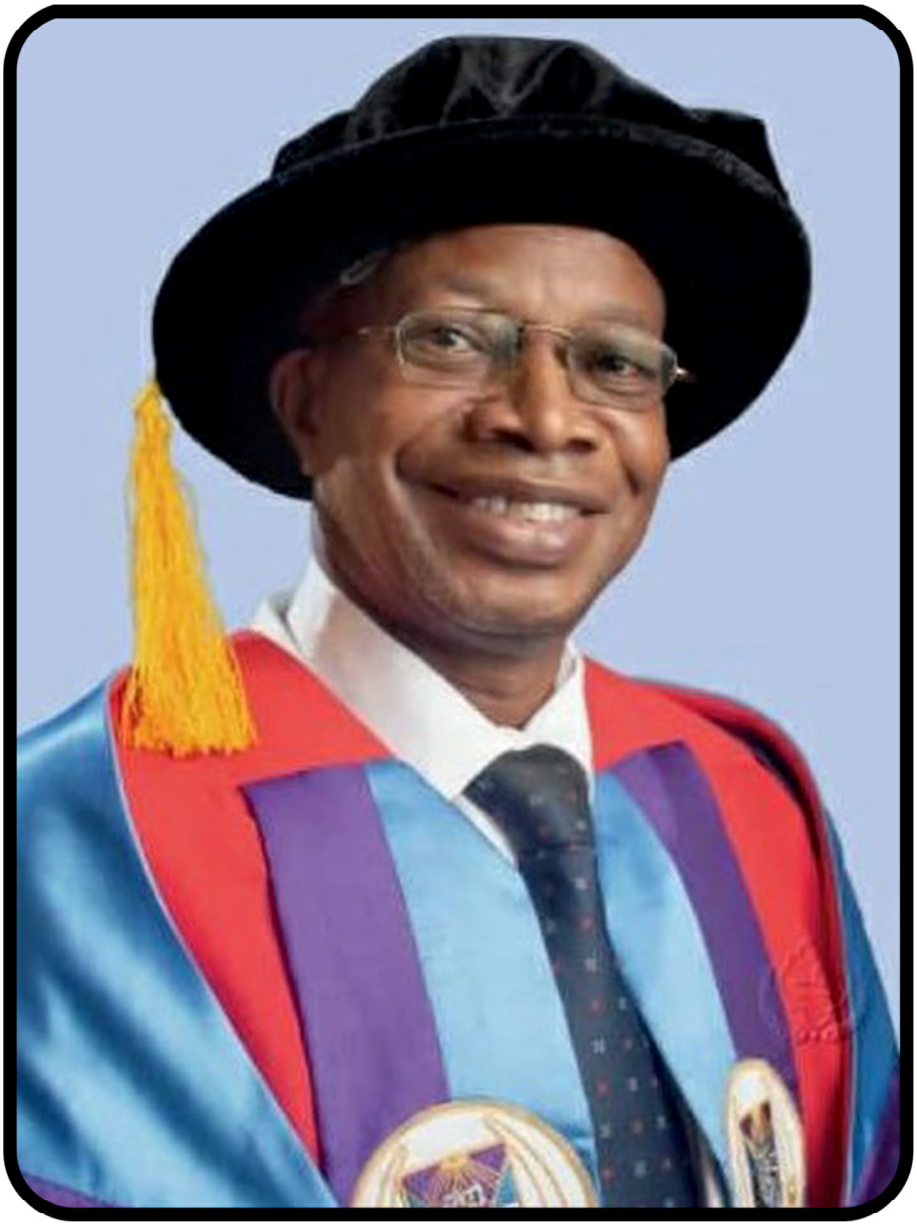
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Dean, School of Postgraduate Studies

FOREWORD

The School of Postgraduate Studies is the domain of research activities for scientific, technological and management-related activities in the Federal University of Technology, Akure. The School stands as a beacon of excellence, innovation and advanced scholarship. Therefore, accurate compilation of its curricula and regulatory guidelines is very germane. The need for up-to-date information birthed the current 2025-2029 prospectus.

Postgraduate Studies are more than a continuation of undergraduate studies: it is a transformative journey that deepens knowledge, sharpens critical thinking and fosters originality. We are committed to nurturing an environment where robust academic pursuits meet real-world applications, hence, this prospectus presents the new vision and mission of the School of Postgraduate Studies. It explains what the School stands for and covers the entire management of postgraduate programmes.

The prospectus contains the regulations governing higher degrees and diplomas, the curricula, list of postgraduate teaching staff, guidelines for the preparation and submission of theses and conduct of theses defence, as well as regulations guiding conduct of examinations in the University. Therefore, the prospectus serves as a compass both to the operators of postgraduate programmes and the students on policies and management of postgraduate programmes in the University. Without any doubt, the implementation of these policies will ensure enviable postgraduate programmes of international standard.

I hereby commend the prospectus to the prospective students, postgraduate administrators and other stakeholders to serve as a guide to achieve the objectives of the School of Postgraduate Studies.

Thank you.

***PROF. (MRS) ADENIKE TEMIDAYO OLADIJI**, FAS*
VICE CHANCELLOR. THE FEDERAL UNIVERSITY OF TECHNOLOGY AKURE, NIGERIA.
MAY, 2025

PREFACE

The School of Postgraduate Studies (SPGS), Federal University of Technology, Akure (FUTA) proudly stands as a cornerstone in the actualization of the University's vision to produce highly skilled manpower that drives national development through science, technology, and innovation. Since its formal establishment in 1994 following the approval of the Board of Postgraduate Studies by the University Council in 1986 the School has grown steadily in scope, stature, and impact.

Our postgraduate programmes are meticulously crafted to build upon the strong intellectual and technological foundations laid at the undergraduate level. These programmes are guided by a philosophy rooted in excellence, relevance, and innovation. They are designed to produce top-tier professionals and researchers in core disciplines such as Engineering, Sciences, Agriculture, Environmental Technology, Logistics and Innovation Technology, Earth and Mineral Sciences, and related fields.

In pursuit of our mandate, the School has adopted a set of core values that guide all operations and academic engagements. As a dynamic academic unit, the SPGS:

1. Recognizes research as a fundamental pillar in achieving the University's vision and mission.
2. Upholds discipline, accountability, and adherence to the rules and regulations that govern postgraduate education.
3. Encourages research that addresses the evolving socio-economic and developmental needs of Ondo State and Nigeria at large.
4. Develops and implements postgraduate programmes that are not only academically rigorous but also flexible and responsive to emerging global trends in science, technology, and innovation.

Over the years, the School has undergone a series of transformative reforms aimed at aligning its operations with global best practices in postgraduate education. Notable innovations and milestones include:

- Strategic expansion of postgraduate offerings across departments.
- Harmonization of academic calendars to streamline postgraduate and undergraduate activities.
- Deployment of an electronic portal (e-SPGS) to enhance administrative efficiency and student experience.
- Liberalization of entry requirements to accommodate diverse academic qualifications, including HNDs, bachelor's degrees, postgraduate diplomas, and master's degrees.
- Swift processing of academic transcripts, typically within one to two weeks of successful application.
- Regular seminars and workshops to equip students with the tools for successful research and publication.
- Establishment of the SPGS Research Journal (JOSTIR) as a platform for scholarly dissemination.

- Proposal for upgrading the SPGS into a fully autonomous College of Postgraduate Studies.
- Implementation of a robust quality assurance framework, including a raised minimum pass grade from 40% to 50%.
- Assignment of supervisors at the point of admission to ensure early academic guidance.
- Mandatory publication in high-impact journals as a graduation requirement for M.Tech and Ph.D students.
- Elimination of avoidable programme elongation through improved academic monitoring and proper information dissemination.
- Consideration of direct admission of first-class graduates into M.Phil./Ph.D programmes.
- Timely and responsive student support services.
- Provision of world standard examination halls and board rooms adequately equipped for virtual oral examinations.
- Installation of solar inverters to ensure 24-hour power supply within SPGS facilities.
- Maintenance of a serene and professional work environment for staff.
- Promotion of cordial and respectful relationships between staff and students.
- Option for Ph.D graduates to acquire academic robes upon request.

Indeed, the School of Postgraduate Studies has recorded tremendous growth across academic, infrastructural and administrative dimensions. This remarkable progress reflects our commitment to excellence and our resolve to remain at the forefront of postgraduate education in Nigeria.

This edition of the Prospectus is a continuation of that tradition providing up-to-date and comprehensive information on admission guidelines, academic regulations, programme structures, and procedures from registration to graduation. It is a vital reference for students, Schools, administrators, and stakeholders who are involved in the pursuit and management of postgraduate education at FUTA.

I wish to extend my sincere appreciation to all who have contributed to the journey and success of the School thus far former Vice Chancellors, Deans, Sub-Deans, Directors, Secretaries to the Postgraduate School and the dedicated staff of the SPGS. I am especially grateful to the current Vice Chancellor, **Professor (Mrs.) Adenike Temidayo Oladiji, FAS**, for her unwavering support and visionary leadership that continues to inspire progress within the School.

We look forward to a future of even greater achievements, as we continue to shape scholars and innovators who will lead the transformation of our nation and the world.



Prof. O. A. Bello-Olusoji
Dean, School of Postgraduate Studies
Federal University of Technology, Akure (FUTA)

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VISITOR AND PRINCIPAL OFFICERS OF THE UNIVERSITY

VISITOR

His Excellency Bola Ahmed Tinubu, GCFR

President and Commander – in – Chief of the Armed Forces of the Federal Republic of Nigeria

CHANCELLOR

Alhaji Umar Faruk II, CON

Emir of Katagum

PRO-CHANCELLOR

Senator (Prof.) Nora Ladi Dadunt

Pro-Chancellor, Chairman Governing Council, FUTA

VICE-CHANCELLOR

Prof. A. T. Oladiji, FAS

DEPUTY VICE-CHANCELLOR (ACADEMIC)

Prof. T. T. Amos

DEPUTY VICE-CHANCELLOR (DEVELOPMENT)

Prof. S. S. Oluyamo

REGISTRAR

Mr. C. O. Adeleye

BURSAR

Mr. Peter Osadugba

UNIVERSITY LIBRARIAN

Dr. Robert Akinade Awoyemi

STAFF OF THE SCHOOL OF POSTGRADUATE STUDIES

S/N	NAME	DESIGNATION	STATUS
1	Prof. O. A. Bello-Olusoji	Dean	Professor
2	Dr. O. F. Enisan	Sub-Dean, M. Tech.	Reader
3	Dr. J. F. Odesanya	Sub-Dean, Ph. D	Reader
4	Dr. A. O. Olalemi	Sub-Dean, PGD	Reader
5	Mr. T.A. Obanewa	Director/Secretary, SPGS	Director
6	Mr. O.A. Taiwo	Head, SPGS Bursary	Chief Accountant
7	Mr. P. G. Oluborode	Head, Exams & Records Unit	Principal Assistant Registrar
8	Mrs. A. B. Abimbade	Head, IT Unit	Chief Systems Programmer
9	Mr. O.O. Samuel	Head, Library Unit	Principal Library Officer I
10	Mrs. O. T. Olaniyan	Executive Officer (Sec's Office)	Asst. Chief Executive Officer
11	Mrs. H. Y. Adu-Olufemi	Secretary to the Dean, SPGS	Asst. Chief Conf. Secretary
12	Mrs. A. O. Awolusi	Executive Officer (Dean's Office)	Principal Executive Officer I
13	Mrs. T. R. Adesipe	Computer Operator, Exams. & Records	Asst. Chief Computer Operator
14	Mr. S.S. Olowu	Principal Account	Accountant II
15	Mrs. T. V. Samuel	Executive Officer, Accounts	Principal Executive Officer
16	Mr. Y. R. Yesufu	Executive Officer Exams. & Records	Principal Executive Officer I
17	Mr. Z. O. Adebiyi	Executive Officer, Exams. & Records	Principal Executive Officer
18	Mr. M. O. Olorunfemi	Executive Officer Admissions	Snr. Executive Officer
19	Mrs. C. A. Akindele	Executive Officer (Sec's Office)	Snr. Executive Officer
20	Mrs. O. F. Asse	Admission Officer	Assistant Registrar
21	Mrs. R. L. Adeola-Adetokunbo	Executive Officer Dean's Office	Higher Executive Officer
22	Mrs. M. Adekunle	Asst. Exams. & Records Officer	Administrative Officer II
23	Mrs. O. A. Obajemihi	Asst. Admissions Officer	Administrative Officer II
24	Mrs. R. Divine-Orukpe	Executive Officer Transcript	Higher Executive Officer
25	Mrs. A. A. Oyimeh	Executive Officer Exams. & Records	Executive Officer
26	Mr. S. J. Lanade	Driver	Chief Motor Driver
27	Mrs. O. S. Bayo-Joseph	Clerical Officer Director/Secretary's Office	Chief Clerical Officer
28	Mrs. A. O. Oguntoye	Executive Officer Dean's Office	Asst. Executive Officer
29	Mrs. F. M. Olarewaju	Office Attendant Director/Secretary's Office	Head Office Attendant

FORMER DEANS OF THE SCHOOL OF POSTGRADUATE STUDIES

Prof. G. O. Iremiren	January, 1993 – September, 1995
Prof. T.A. Afolayan	October, 1995 – June, 1998
Prof. T. O. Kadeba	August, 1998 – February, 2004 Prof.
V. A. Aletor	August, 2004 – July, 2008
Prof. O. Arayela	August 2008 – July, 2010
Prof. M. A. K. Smith	August, 2010 – July, 2014
Prof. A. A. Akindahunsi	August, 2014 – September, 2014
Prof. M. O. Ajewole	September, 2014 – August, 2018
Prof. C. Arum	August, 2018 – July, 2022

FORMER SUB-DEANS OF THE SCHOOL OF POSTGRADUATE STUDIES

Dr. V. S. A. Adeloye	2006 – 2008
Dr. G. Oboh	2008 – 2010
Dr. V. A. J. Adekunle	2010 – 2011
Dr. (Mrs.) B. J. Akinyele	2011 – 2015
Dr. O. O. Simon-Oke	2015 – 2017 (Sub-Dean, M. Tech.)
Engr. Dr. S. P. Ayodeji	2015 – 2017 (Sub-Dean, PGD)
Dr. P. S. Ola	2015 – 2017 (Sub-Dean, Ph. D)
Dr. O. A. Awodele	2017 – 2019 (Sub-Dean, M. Tech.)
Dr. D. O. Folorunso	2017 – 2019 (Sub-Dean, PGD)
Dr. M. Adegbenro	2019 – 2021 (Sub-Dean, M. Tech.)
Dr. E. O. Onagbola	2019 – 2021 (Sub-Dean, PGD)
Dr. O. Alowolodu	2021 – 2023 (Sub-Dean, Ph. D)
Dr. T.A. Ayedun	2022 – 2024 (sub-Dean, PGD)
Dr. (Mrs.) C. M. Ikumapayi	2023 – 2025 (Sub-Dean, Ph. D) Dr. A.
K. Mogaji	2023 – 2024 (Sub-Dean, M. Tech.)

SECTION ONE
BACKGROUND OF THE SCHOOL OF POSTGRADUATE STUDIES

1.1 Postgraduate Studies

The Federal Universities of Technology were set up to give prominence to technological training and provide the much required impetus for rapid technological and industrial development.

Their primary objectives are to:

(i) develop and offer academic and professional programmes leading to the award of Certificates, Diplomas and degrees (Masters and Doctoral) which emphasize planning, adaptive, technical, maintenance, development, horizontal and productive skills in the engineering, scientific, agricultural, environmental, management, medical and allied professional disciplines;

(ii) act as agents and catalysts, through postgraduate research and training for the most efficient, effective and economic utilization, exploitation and conservation of the country's natural, economic and human resources;

(iii) offer to the general population, as a form of public services, the results of research and foster the practical applications of these results;

(iv) identify technological problems and needs of the society relevant to the immediate localities of the University and solve them within the context of national needs; and

(v) provide and promote sound basic scientific training reflecting indigenous culture and enhancing national unity, while at the same time ensuring the production of socially matured citizens.

In pursuance of these objectives and in recognition of the need for interdisciplinary approach to the solution of most practical problems and the application of science and technology to development, the Federal University of Technology, Akure has adopted the School system (as opposed to the Faculty) as the basic unit, thus endorsing the concept of a School as a fully integrated unit of a group of related subjects or disciplines which have a common academic interest in teaching and research.

1.2 The School of Postgraduate Studies, FUTA

As part of its Vision and Mission in terms of the development of high-level skilled manpower for the Country, Council of the Federal University of Technology, Akure approved the establishment of the Board of Postgraduate Studies in 1986, which metamorphosed into School of Postgraduate Studies in 1994.

In pursuance of the primary objective of the Federal Government for the establishment of the Universities of Technology, the Postgraduate programmes of the Federal University of Technology, Akure are intended to consolidate and build upon the solid intellectual and technological foundations, which the undergraduate courses in the University have been most carefully designed to achieve.

The need for purposeful and functional education, which fosters technology for self-reliance, as an antidote to under-development, is the underlying principle for the design of specific Postgraduate programmes in the various Schools of the University. The mission of the Postgraduate School includes the development and offering of academic and professional programmes leading to the award of postgraduate diplomas and higher degrees, which emphasize planning, adaptive and productive skills in the engineering, scientific, agricultural, environmental and allied professional disciplines.

Within the context of these general objectives therefore, graduate students of the Federal University of Technology, Akure are trained to:

(i) have a very sound and in-depth knowledge of the basic principles underlying the body of knowledge they are being trained to master;

(ii) develop a broad analytical mind that will enhance major intellectual and technological breakthroughs to improve the lot of man and the society; and

(iii) be adequately versed in their discipline, and be competent to impart the knowledge to others in a conducive academic environment to ensure the continued existence of the system.

To facilitate the attainment of these objectives, the University, through the Boards of the School of Postgraduate Studies:

(a) provides facilities for training and research for those, whose future careers will be teaching and research at tertiary institutions; and for those who may have to operate in research and development situations in the public or private sectors; and

(b) provides both short and long-term training facilities aimed at improving and upgrading intellectual and cultural bases of high-level human resources that are indispensable for national development.

1.3 Boards of the School of Postgraduate Studies

Senate, at its Special Meeting of 15th April, 2015, considered the Report of Committee on the Overhauling of School of Postgraduate Studies and approved that a distinction be made between the Board of School of Postgraduate Studies and the Academic Board of School of Postgraduate Studies.

1.3.1 The Board of the School of Postgraduate Studies

1.3.1.1 Membership

Vice-Chancellor	-	Chairman
Dean, SPGS	-	Member
Sub-Dean (Ph.D)	-	Member
Sub-Dean (Masters)	-	Member

Sub-Dean (PGD)	-	Member
University Librarian	-	Member
Director, CCE	-	Member
Director, CERAD	-	Member
Director, WASCAL	-	Member
Director, Academic Planning	-	Member
Director, CRC	-	Member
Director, CRET	-	Member
Director, INTEDH	-	Member
All Postgraduate programme lecturers with Ph.D degree who are not registered Postgraduate Students in the University	-	Member
Any Other Member(s) as may be approved by Senate	-	Member
Secretary, School of Postgraduate Studies	-	Secretary

1.3.1.2. Functions of the Board of Postgraduate Studies

The Board of the School of Postgraduate Studies shall normally meet once at the end of every academic session. However, when the election of the Dean does not fall within the same period, a special meeting of the Board shall be convened.

The Board shall perform the following functions:

(i) elect the Dean, School of Postgraduate Studies in accordance with the guidelines as stated in the University Statute;
(ii) receive and consider reports of activities of the School of Postgraduate Studies at the end of every academic session;
(iii) ensure compliance with rules and regulations governing the running of postgraduate academic programmes in the School of Postgraduate Studies;
(iv) advise the Academic Board of Postgraduate Studies on how to improve the academic standard of the Postgraduate Studies to be in tandem with best global practices; and
(v) perform any other responsibilities as may be delegated by the University Senate from time to time.

1.3.2 Academic Board of Postgraduate Studies

The Academic Board of Postgraduate Studies (ABPGS) shall be the clearing house for all academic matters in respect of SPGS.

1.3.2.1. Membership

Dean, SPGS	-	Chairman
Sub-Dean (Ph.D)	-	Member
Sub-Dean (Masters)	-	Member
Sub-Dean (PGD)	-	Member
University Librarian	-	Member
Director, CCE	-	Member
Director, CERAD	-	Member
Director, CESRA	-	Member
Director, WASCAL	-	Member
Director, Academic Planning	-	Member
Director, CESRA	-	Member
Director, CRET	-	Member
Director, International Office	-	Member
Director, CRC	-	Member
Director, INTEDH	-	Member
Chairman, SPGAC of each School	-	Member
One Representative for each Academic Department not below Senior Lecturer grade, with Ph.D degree who is not a registered Postgraduate Student in the University	-	Member
Any Other Member(s) as may be approved By Senate	-	Member
Secretary, SPGS	-	Secretary
Admission Officer, SPGS	-	In attendance
Exams & Records Officer, SPGS	-	In attendance
I.T. Officer, SPGS	-	In attendance

1.3.2.2 Functions of the Academic Board

The Academic Board of Postgraduate Studies, which meets on the specified date every month on behalf of Senate, performs the following functions:

(i) considers and recommends to Senate, submissions from Schools on admissions, registrations, fields of study, research proposals, nomination of supervisors and appointment of internal and external examiners;
(ii) Approves the re-constitution of sub-committees of the Academic Board for Senate ractification;
(iii) makes recommendations to Senate on candidates for the award of higher degrees, postgraduate diplomas and certificates;
(iv) examines postgraduate curricula and examination programmes submitted by Departments through the School Postgraduate Advisory Committee and makes recommendations to Senate;
(iv) receives Annual Progress Reports (APR) from individual student for the purpose of monitoring their progress;
(v) interprets and operates postgraduate regulations, prepares an annual report of its activities for the consideration of the Board of Postgraduate Studies and report to Senate for approval;
(v) prepares and operates a budget necessary for executing the functions of the School (paying particular attention to fellowships, scholarships, visiting lectureships and postgraduate programmes) and coordinates budgets for Postgraduate Studies from the Schools;
(vi) recommends to Senate, periodically, a comprehensive review of general regulations, progress and development of Postgraduate Studies;
(vii) takes and considers all results in respect of all programmes being run by Departments, and make appropriate recommendations to Senate;
(viii) considers and approves applications for admission and extension of studentship in line with approved guidelines by Senate;
(ix) oversees and regulates the programmes, admissions, examinations and records of all approved external bodies involved in the University's postgraduate degree programmes;

(x) registers and keeps up-to-date records of all Postgraduate students;

(xi) performs any other responsibilities that may be delegated to the School by Senate from time to time.

1.3.2.3 Membership and Functions of Committees of Academic Board of Postgraduate Studies for 2024/ 2025 Academic Session

S/No	*Name of Committee*	*Members*	*Terms of Reference*
1.	Postgraduate Admissions Committee	• Prof. I.F. Titiladunayo - Chairman • Prof. S. O. Aro (SAAT) - Member • Prof. O. O. Obe (SOC) - Member • Dr. A.O. Adepoju (SLIT) - Member • Dr. O.O. Alabi (SPS) – Member • Dr. N.B. Ezeokoli (SET) – Member • Dr. (Mrs.) B. C. Adedayo (SLS) - Member • Dr. (Mrs) O. Okeowo (SBMS) – Member • Dr A.F. Folorunso (SEMS) – Member • Sub-Deans (PGD, Masters, Ph.D) - Member • Secretary, SPGS - Member • Mrs. A. B. Abimbade - Member • Mrs Asse Oluseyi Mercy A. (AR, Adm.) – Secretary	i) To consider and advise the Board on recommendations from the various departments in the University on postgraduate admissions; ii) To consider and make appropriate recommendations to the Board on deferment of admissions; iii) To handle requests for reactivation of studies, extension of time on programmes; iv) To handle review of regulations guiding postgraduate programmes; v) To advise the Board from time to time on issues bothering on postgraduate admissions in the University.
2.	Results and Examiners' Report Committee	• Prof. T.T. Yusuf – Chairman • Prof B. Kareem (SEET) • Dr. O.O. Daramola (SEET) • Prof. O. J. Ojo (SLIT) • Prof. E. O. Ogolo (SPS) • Prof. T.P. Ologunwa (SET) • Prof J.A.V. Olumurewa (CRET) • Prof. J. S. Ojo (CESRA) • Prof. O.A. Kolawole (SLS) • Prof M.K. Adeyeri (SIMME) • Prof. O.O. Aluko – (SET) • Dr Oladeji - (SAAT) • Sub-Deans (PhD, Masters, & PGD) • Secretary, SPGS • Mr. P.G. Oluborode PAR (E&R) – Secretary • Mrs. Mercy Adekunle (AOII,) – A/Secretary	

S/No	Name of Committee	Members	Terms of Reference
3.	Curriculum Management and Development Committee (NUDTAS)C Accreditation	• Prof. K. D. Adedayo - Chairman • University Librarian • Director, Academic Planning • Prof. G.O. Fadairo • Prof. (Mrs) O.O. Oyeleke (SAAT) • Dr. B.C. Ubochi (SESE) • Dr. A. A. Komolafe (SEMS) • Dr. O.C. Adenigbo (SLIT) • Prof. O. Olabode (SOC) • Prof. (Mrs) O.B. Faluyi (SAAT) • Dr. K.M. Owolabi (SPS) • Sub-Deans (PGD, Masters & PhD) • Secretary, SPGS - Member • Mrs O. F. Asse – Secretary	i) To consider proposals for amendment of postgraduate courses, introduction of new programmes and advise the Board of Postgraduate Studies as appropriate; ii) To recommend to the Board of Postgraduate Studies, policies, criteria and order of priority in the academic development of the School of Postgraduate Studies and to keep these under constant review; ii) To recommend to the Board, desired change in the academic structure of postgraduate programmes in the University; and iv) To consider any other matter that may be referred to it by the Dean or Board of the Postgraduate Studies. iii) To handle new or revised curricula from departments
4.	Thesis Title Registration Committee	• Prof. A. A. Badejo - Chairman • Prof. O.P. Aiyelari (SAAT) • Prof. (Mrs.) B. D. Oluyemi-Ayibiowu (SIMME) • Dr. O.A. Alabi (SLS) • Dr. I.A. Adeyemo (SEMS) • Dr. P.O. Akanni (SET) • Dr. O.P. Ologunwa (SLIT) • Prof. O. Olabode (SOC) • Prof. A.I. Popoola (SPS) • Dr. (Mrs.) O. A. Daramola – (LIB) • Dr (Mrs) O. O. Makinde (SLS) • Dr. (Mrs) G.O. Alofun (INTEDH) • Prof. T. E. Abioye (SEET) • Sub-Deans (Ph.D, Masters & PGD) • Secretary, (SPGS) • Mr. P.G. Oluborode PAR (E&R) - Secretary • Mrs. O. A. Awolusi (PEO I) • Mrs. Obajemihi A.O (OA II)	i) To receive, consider and advise the Board of Postgraduate Studies appropriately on submissions from various departments in the University on Registration of Theses Titles, and appointment of Examiners for Masters and Doctoral Examinations, and Postgraduate Diploma results; ii) To handle lists of qualified postgraduate teachers from Departments iii) recommendation for postgraduate scholarships; and iv) To examine and advise as appropriate on postgraduate curricular and examinations programmes submitted by departments in the University.

S/No	Name of Committee	Members	Terms of Reference
5.	Annual and Lecture/Conference/Seminar; Endowment & Development Committee/ Colloquium +	• Prof. C. Akinbile - Chairman • Dr. (Mrs.) O. O. Sobola (SAAT) • Prof. S. P. Ayodeji (SIMME) • Dr. (Mrs) D.F. Oke (ENT, SLIT) • Dr. J. Isa (SIMME) • Dr. A. E. Oke (SET) • Dr. N.B. Ezeokoli (SET) • Dr. B. Ogunlade (SBMS) • Sub-Deans – (PGD, Masters, Ph.D) • Secretary, SPGS • Mrs. Obajemihi A.O (AOII, E&R) - Secretary	i) To make proposals to the Board of Postgraduate Studies on the School's Annual Lecture Series; ii) To implement all such proposals as may be approved by the Dean or Board of Postgraduate Studies; iii) To facilitate and organize the School of Postgraduate Studies' Annual Lectures; and iv) To make recommendations to the Dean or the Board of Postgraduate Studies as may be necessary from time to time.
6.	Postgraduate Diploma Advisory Committee	• Prof. K. F. Akingbade (Chairman) • Sub-Dean (PGD) • Departmental PGD Coordinators • Secretary, SPGS • Mrs. Asse Oluseyi F. (AR) – Secretary • Mrs. Mercy Adekunle (OA II – A/Secretary	To consider issues regarding Postgraduate Diploma Programme
7	Postgraduate Studies Editorial Board Annual Progress Report Committee	• Prof. Ayodeji Peter Sesan – Editor-in-Chief • Prof. A.I. Popoola (SPS) • Dr. (Mrs) O. V. Ayodele (SAAT) • Dr. (Mrs.) O. Owolafe (SOC) • Dr. B. C. Ubochi (SESE) • Dr. O. O. Olalemi (SLS) • Dr. J. F. Odesanya – Technical Secretary • Mr. Aransiola S. – Secretary	
8	SPGS Research	• Prof A.O. Kolawole – Chairman • Dr. J.O. Owoseni (SEMS) • Dr. (Mrs) M.L. Adeleke (SAAT) • Prof. F.E. Lasehinde (SLS) • Prof. B.M. Kuboye (SOC) • Dr. J.F. Odesanya (SLIT) • Dr. (Mrs) O.M. Okeowo (SBMS) • Prof. M.O. Alabi (SET) • Dr.O.O. Daramola (SIMME) • Mrs Asse Oluseyi F. (AR) – Secretary	-

SECTION TWO
POSTGRADUATE ACADEMIC PROGRAMMES IN THE UNIVERSITY

2.0 LIST OF HIGHER DEGREE PROGRAMMES INCLUDING POSTGRADUATE DIPLOMA (PGD) IN THE UNIVERSITY.

(i) Doctor of Philosophy (Ph. D)
(ii) Master of Philosophy (M. Phil.)/Ph.D
(iii) Master of Agricultural Technology (M. Agric. Tech.); Master of Engineering (M. Eng.); and Master of Technology (M. Tech.).
(iv) Postgraduate Diploma (PGD)

2.1 School of Agriculture and Agricultural Technology (SAAT)

Doctor of Philosophy (Ph. D); Master of Agricultural Technology (M. Agric. Tech.); Master of Technology (M.Tech. for only Department of Food Science and Technology); and Postgraduate Diploma (PGD) are available in the following Departments and Options:

(i) Department of Agricultural Extension and Communication Technology (AEC)

(a) PGD Agric. in Extension and Communication Technology
(b) M. Agric. Tech. in Agric. Extension & Communication Technology
  i) General Extension
  ii) Rural Development
  iii) Rural Sociology
  iv) Technology Transfer
  v) Communication
(c) Ph.D
  i) General Extension
  ii) Rural Development
  iii) Rural Sociology
  iv) Technology Transfer
  v) Communication Technology

(ii) Department of Agricultural and Resource Economics (ARE)

(a) M. Agric. Tech. Agric. Resource Economics
  i) Production Economics
  ii) Environmental Economics
  iii) Farm Management
  iv) Finance & Marketing
(b) Ph. D
  i) Production Economics
  ii) Environmental Economics
  iii) Farm Management
  iv) Finance & Marketing

(iii) Department of Animal Production and Health (APH)

(a) PGD Animal Production and Health
(b) M. Agric. Tech. (Animal Production)
  i) Agricultural Biochemistry and Nutrition
  ii) Animal Breeding and Genetics
  iii) Animal Production and Management (Poultry, Swine, Sheep and Goat, Rabbit/ Micro-livestock)
  iv) Animal Physiology (Reproductive Physiology)
(c) M. Agric. Tech. (Animal Health)
  i) Animal Parasitology
  ii) Animal Microbiology
  iii) Farm Hygiene and Disease Prevention
(d) Ph. D (Animal Production)
  i) Agricultural Biochemistry and Nutrition
  ii) Animal Breeding and Genetics
  iii) Animal Production and Management (Poultry, Swine, Sheep and Goat, Rabbit/Micro-livestock)
  iv) Animal Physiology
(e) Ph. D (Animal Health)
  i) Animal Parasitology
  ii) Animal Microbiology
  iii) Farm Hygiene and Disease Prevention

(iv) Department of Crop, Soil and Pest Management (CSP)

(a) PGD (Crop, Soil and Pest Management)
(b) M. Agric. Tech.(Crop Management Technology)
  i) Plant Systematics & Taxonomy
  ii) Plant Breeding & Genetics
  iii) Plant Physiology
  iv) Horticulture
  v) Agronomy
(c) M. Agric. Tech (Soil Management Technology)
  i) Soil Fertility
  ii) Fertilizer Use Technology
  iii) Land Survey and Management
  iv) Plant Nutrition
  v) Soil Survey & Classification
(d) M. Agric. Tech (Pest Management Technology)
  i) Crop Entomology
  ii) Plant Pathology
  iii) Nematology
  iv) Plant Virology
  v) Weed Management
  vi) Weed Biology & Ecology
(e) Ph. D (Crop Management Technology)
  i) Plant Systematics & Taxonomy
  ii) Plant Breeding & Genetics
  iii) Plant Physiology
  iv) Horticulture
  v) Agronomy

(f) Ph. D (Soil Management Technology)
- i) Soil Fertility
- ii) Fertilizer use Technology
- iii) Land Survey and Management
- iv) Plant Nutrition
- v) Soil Survey & Classification

(g) Ph. D (Pest Management Technology)
- i) Crop Entomology
- ii) Plant Pathology
- iii) Nematology
- iv) Plant Virology
- v) Weed Management
- vi) Weed Biology & Ecology

(v) Department of Fisheries and Aquaculture Technology (FAT)

(a) PGD (Fisheries and Aquaculture Technology)

(b) M. Agric. Tech. Fisheries & Aquaculture Technology
- i) Aquaculture
- ii) Fisheries Management
- iii) Fish Nutrition
- iv) Fish Breeding
- v) Fisheries Economics
- vi) Fish Processing & Utilization

(c) M. Phil Ph.D (Fisheries & Aquaculture Technology)
- i) Aquaculture
- ii) Fisheries Management
- iii) Fish Nutrition
- iv) Fish Breeding
- v) Fisheries Economics
- vi) Fish Processing & Utilization

(d) Ph.D (Fisheries & Aquaculture Technology) Same as (C) above

(vi) Department of Ecotourism and Wildlife Management (EWM)

(a) PGD Ecotourism and Wildlife Management

(b) M. Agric. Tech. Ecotourism & Wildlife Management
- i) Wildlife Management
- ii) Biodiversity Ecology
- iii) Ecotourism Management
- iv) Wildlife Domestication

(c) Ph. D (Ecotourism & Wildlife Management)
- i) Wildlife Management
- ii) Biodiversity Ecology
- iii) Ecotourism Management

(viii Department of Food Science and Technology (FST)

(a) PGD Food Science and Technology

(b) M. Tech. Food Science and Technology
- i) Food Chemistry
- ii) Human Nutrition
- iii) Food Processing
- iv) Post-Harvest Technology

(c) PhD (Food Science and Technology)
- i) Food Chemistry
- ii) Human Nutrition
- iii) Food Processing
- iv) Post-Harvest Technology

(vii) Department of Forestry & Wood Technology (FWT)

(a) PGD
- i) Forestry and Wood Technology
- ii) Environmental Management

(b) M. Agric. Tech. Forestry & Wood Technologyi) Forest Resources Management
- ii) Forest Biology/Silviculture
- iii) Agroforestry/Soils
- iv) Wood Science Technology
- v) Wood Products Technology
- vi) Forest Inventory & Biometrics

(c) PhD (Forestry & Wood Technology)
- i) Forest Resources Management
- ii) Forest Biology/Silviculture
- iii) Agroforestry/Soils
- iv) Wood Science Technology
- v) Wood Products Technology
- vi) Forest Inventory & Biometrics

In addition to the above-stated options, M.Agric.Tech and PhD students may conduct research in the following areas:
- i) Herbal Science Natural Therapeutic
- ii) Biocomposite Technology
- iii) Furniture Design & Production
- iv) Wood Processing Technology

2.2. SCHOOL OF BASIC MEDICAL SCIENCES

(i) Department of Human Anatomy

(a) Masters of Science (M.Sc.)
- i) Reproductive Biology
- ii) Neurobiology
- iii) Anthropology and Forensic Anatomy
- iv) Applied Anatomy and Medical Imaging

(b) Doctor of Philosophy (PhD)
- i) Reproductive Biology
- ii) Neurobiology
- iii) Anthropology and Forensic Anatomy
- iv) Applied Anatomy and Medical Imaging

(ii) Department of Physiology

(a) Master of Science (M.Sc.)
- (i) Cardiopulmonary physiology;
- (ii) Metabolism, Endocrinology and Reproductive Physiology;
- (Iii) Gastrointestinal Physiology;
- (iv) Neurophysiology

(b) Master of Philosophy (M.Phil) in Physiology.
- (i) cardiopulmonary physiology;

(ii) renal physiology;
(iii) metabolism and endocrine physiology;
(iv) reproductive physiology;
(v) gastrointestinal physiology;
(vi) neurophysiology; and
(vii) sports and exercise physiology.

(c) Masters of Philosophy / Doctor of Philosophy (M.Phil/PhD) in Physiology
(i) cardiorespiratory physiology;
(ii) renal physiology;
(iii) metabolism and endocrine physiology;
(iv) reproductive physiology;
(v) gastrointestinal physiology;
(vi) neurophysiology; and
(vii) sports and exercise physiology.

2.3 SCHOOL OF COMPUTING

(a) Department of Computer Sciences (CSC)

PROGRAMMES OFFERED
(i) Postgraduate Diploma (PGD)
(ii) Master of Tech. (M.Tech.)
(iii) Master of Philosophy (M.Phil.)
(iv) Doctor of Philosophy (Ph.D.)

(b) Department of Cyber Security
(a) Postgraduate Diploma (PGD)
(b) Master of Technology (M. Tech) in Cyber Security
i) Cyber Security Engineering
ii) Cyber Security Governance, Framework and Standards
iii) Cyber Security Operations
iv) Cyber Threat Intelligence
v) Cyber Security Risk Managemen
(c) Master of Philosophy (M. Phil) Programme in Cyber Security
(d) Master of Philosophy/doctor of Philosophy (M. Phil/phd) Programme in Cyber Security
Doctor of Philosophy (Ph.d) Programme in Cyber Security

2.4 SCHOOL OF EARTH AND MINERAL SCIENCES (SEMS)

Postgraduate Diploma Programmes (PGD)
Master of Technology (M.Tech.), And
Doctor of Philosophy (Ph.D)
are available in the following Departments and Options:

(i) Department of Applied Geology (AGY)
(a) PGD Applied Geology
(b) M. Tech. Applied Geology
i) Mineral Exploration
ii) Remote Sensing
iii) Hydrogeology and Engineering Geology
iv) Petroleum and Sedimentary Geology
(c) Ph. D Applied Geology
i) Remote Sensing
ii) Hydrogeology
iii) Engineering Geology
iv) Petroleum Geology
v) Sedimentology
vi) Structural Geology

(ii) Department of Applied Geophysics (AGP)
(a) PGD Exploration Geophysics
(b) M. Tech. Exploration Geophysics
i) Petroleum Exploration
ii) Mining Geophysics
iii) Groundwater/Environmental/ Engineering Geophysics
(c) Ph.D Exploration Geophysics
i) Petroleum Exploration
ii) Mining Geophysics
iii) Groundwater/Environmental/ Engineering Geophysics

(iii) Department of Marine Science and Technology

PROGRAMME OFFERED
(a) Postgraduate Diploma (PGD)
(b) Master of Technology (M.Tech.)
(i) Chemical Oceanography
(ii) Marine and Coastazl Environmental Science
(iii) Geological Oceanography
(iv) Marine Geophysics
(v) Physical Oceanography
(c) Doctor of Philosophy (P.h.D)
(i) Chemical Oceanography
(ii) Marine and Coastal Environmental Science
(iii) Geological Oceanography
(iv) Marine Geophysics
(v) Physical Oceanography

(iv) Department of Meteorology and Climate Science (MCS)
(a) PGD Meteorology
(b) M. Tech. Meteorology
i) Numerical Weather Forecasting
ii) Agrometeorology
(c) Ph. D Meteorology
i) Numerical Weather Forecasting
ii) Synoptic Meteorology
iii) Aviation Meteorology
iv) Satellite Meteorology
v) Air Pollution Meteorology
vi) Agro meteorology

(v) Department of Remote Sensing and Geoscience Information System
PROGRAMME OFFERED
a. Post Graduate Diploma (PGD)
b. Master of Technology (M.Tech.)

i) Earth Resources Exploration
ii) Natural Hazards & Disaster Risk Management
Iii) Geoinformation Science
iv) Natural resources Management

c. Doctor of Philosophy (PhD)
i) Earth Resources Exploration
ii) Natural Hazards & Disaster Risk Management
iii) Geoinformation Science
iv) Natural resources Management

2.5 SCHOOL OF ELECTRICAL SYSTEMS ENGINEERING (SESE)

(i) Department of Computer Engineering (CPE)

PROGRAMME OFFERED

a. Post Graduate Diploma (PGD)
b. Masters of Engineering (M.Eng.)
c. Doctor of Philosophy (Ph.D.)

Available Options / Specialization

i. Software System Engineering
ii. Data Communication and Networking
iii. Artificial Intelligence
iv. Robotics and Automation

(ii) Department of Electrical & Electronics Engineering (EEE)

(a) PGD Electrical and Electronics Engineering
(b) M. Eng. Electrical & Electronics Engineering
i) Power Systems Engineering
ii) Communications Engineering
iii) Control Engineering
(c) Ph. D Electrical & Electronics Engineering
i) Power Systems Engineering
ii) Communications Engineering

2.6 SCHOOL OF ENVIRONMENTAL TECHNOLOGY (SET)

Doctor of Philosophy (Ph. D), Master of Technology (M. Tech.) and Postgraduate Diploma (PGD) programmes are available in the following Departments and Options:

(i) Department of Architecture (ARC)
(a) PGD Architecture
(b) M.Tech. Architecture
(c) Master of Philosophy (M.Phil.)
(d) M.Phil./Ph.D
(e) Ph.D Architecture

(ii) DEPARTMENT OF BUILDING (BDG)
(a) POSTGRADUATE DIPLOMA (PGD) IN BUILDING
(b Master of Technology in Building Structures
(c))Master of Technology in Construction Management
. (d)Doctor of Philosophy in Building Structures
(e) Doctor of Philosophy in Construction Management

(iii) Department of Estate Management (ESM)
(a) PGD Estate Management
(b) Master of Real Estate (MRE) (Professional)
i) Land Management
ii) Facilities Management
iii) Plant and Machinery Valuation
(c) M. Tech. (Academic)
i) Estate Management
(d) Ph. D Estate Management

(iv) Department of Industrial Design (IDD)
(a) PGD Industrial Design
i) Ceramics Design
ii) Graphics
iii) Textile Design
(b) M.Tech. Industrial Design
i) Ceramics Design
ii) Graphics
iii) Textile Design
(c) Ph. D Industrial Design
i) Ceramics Design
ii) Graphics
iii) Textile Design

(v) Department of Surveying and Geoinformatics (Svg)
(a) Postgraduate Diploma (PGD)
(b) Master of Technology (M.Tech)
(i) Geodesy
(ii) Photogrammetry
(iii) Remote Sensing
(iv) Hydrography
(v) Geoinformatics
(c) Doctor of Philosophy (Ph.D)
(i) Geodesy
(ii) Photogrammetry
(iii) Remote Sensing
(iv) Hydrography
(v) Geoinformatics

(vi) Department of Quantity Surveying (QSV)
(a) PGD
i) Quantity Surveying
ii) Construction Management
(b) M. Tech. Quantity Surveying
i) Cost Management
ii) Construction Economics
iii) Quantity Surveying Practices
iv) Procurement Studies
(c) Ph. D

(vii) Department of Urban and Regional Planning
(a) PGD Urban and Regional Planning
(b) M.Tech. Urban and Regional Planning
(c) Ph.D Urban and Regional Planning(iii)

2.7 SCHOOL OF INFRASTRUCTURE, MINERALS AND MANUFACTURING ENGINEERING (SIMME)

Doctor of Philosophy (Ph.D), Master of Engineering (M.Eng.)
and Postgraduate Diploma (PGD) programmes are available
in the following Departments and Options:

(i) Department of Agricultural and Environmental
Engineering (AGE)
- (a) PGD Agricultural and Environmental Engineering
- (b) M. Eng. Agric. and Environmental Engineering
  - i) Farm Power and Machinery
  - ii) Soil and Water Engineering
  - iii) Processing and Storage Engineering
  - iv) Farm Structures and Environmental Control
  - v) Alternative Energy
- (c) Ph.D Agric. and Environmental Engineering
  - i) Farm Power and Machinery
  - ii) Soil and Water Conservation Engineering
  - iii) Post-Harvesting Engineering
  - iv) Farm Structures and Environmental Control
  - v) Alternative Energy

(ii) Department of Civil and Environmental Engineering (CVE)
- (a) PGD Civil and Environmental Engineering
- (b) M. Eng. Civil and Environmental Engineering
  - i) Geotechnical Engineering
  - ii) Structural Engineering
  - iii) Transportation Engineering
  - iv) Water Resources and Environmental Engineering
  - v) Construction Engineering
- (c) Ph. D Civil and Environmental Engineering
  - i) Geotechnical Engineering
  - ii) Structural Engineering
  - iii) Transportation Engineering
  - iv) Highway Maintenance & Rehabilitation Engineering
  - v) Water Resources and Environmental Engineering
  - vi) Construction Engineering

(iii) Department of Industrial and Production Engineering

PROGRAMME OFFERED
- a. Post Graduate Diploma (PGD)
- b. Doctor of Philosophy -Ph.D
- c. Masters of Engineering -M.Eng

Available Options / Specialization
- i) Maintenance Engineering
- ii) Advanced Manufacturing Engineering
- iii) Industrial Systems Design and Optimization
- iv) Engineering Management

(iv) Department of Mechanical Engineering (MEE)
- (a) PGD Mechanical Engineering
- (b) M. Eng. Mechanical Engineering
  - i) Production Engineering
  - ii) Industrial Engineering/Operations Research
  - iii) Building Services Engineering
  - iv) Automotive Engineering
  - v) Energy Systems
  - vi) Thermo fluids
  - vii) Computational Fluid Dynamics
- (c) Ph. D Mechanical Engineering
  - i) Production Engineering
  - ii) Industrial Engineering/Operations Research
  - iii) Building Services Engineering
  - iv) Automotive Engineeringv) Energy Systems
  - vi) Thermo fluids
  - vii) Computational Fluid Dynamics

(v) Department of Metallurgical & Materials Engineering (MME)
- (a) PGD Metallurgical & Materials Engineering
- (b) M. Eng. Metallurgical & Materials Engineering
  - i) Production/Mechanical Metallurgy
  - ii) Physical Metallurgy/Corrosion Engineering
  - iii) Materials Engineering
- (c) Ph. D Metallurgical & Materials Engineering
  - i) Production/Mechanical Metallurgy
  - ii) Physical Metallurgy/Corrosion Engineering
  - iii) Materials Engineering

(vi) Department of Mining Engineering (MNE)
- (a) PGD Mining Engineering
- (b) M. Eng. Mining Engineering
  - i) Surface Mining
  - ii) Underground Mining
  - iii) Rock Mechanics
  - iv) Mineral Processing
  - v) Mine Management and Mineral Economics
  - vi) Mine Safety and Environment
  - vii) Mine Surveying & Photogrammetry
- (c) Ph. D Mining Engineering
  - i) Surface Mining
  - ii) Underground Mining
  - iii) Rock Mechanics

iv) Mineral Processing
v) Mine Management and Mineral Economics
vi) Mine Safety and Environment
vii) Mine Surveying & Photogrammetry

2.8 SCHOOL OF LIFE SCIENCE (SLS)

(i) Department of Biology (BIO)
(a) PGD in Food Storage Technology
(b) M. Tech. Biology
i) Food Storage Technology
ii) Applied Parasitology
iii) Environmental Biology and Public Health
iv) Applied Entomology and Pests Management
(c) Ph. D Biology
i) Applied Parasitology
ii) Storage Microbiology
iii) Applied Entomology/Storage Entomology
iv) Post harvest Biology

(ii) Department of Biochemistry (BCH)
(a) PGD Biochemistry
i) Applied Biochemistry
ii) Clinical Biochemistry
(b) M. Tech. Applied Biochemistry
i) Enzymology
ii) Microbial Biochemistry
iii) Food Biochemistry
iv) Toxicology
v) Clinical Biochemistry
(c) Ph. D Biochemistry
i) Enzymology
ii) Microbial Biochemistry
iii) Food/Nutritional Biochemistry
iv) Toxicology

(iii) Department of Microbiology (MCB)
(a) PGD Microbiology
i) Food and Industrial Microbiology
ii) Environmental Microbiology
ii) Medical Microbiology
(b) M. Tech. Microbiology
i) Food Microbiology
ii) Environmental Microbiology
iii) Medical Microbiology
(c) Ph.D Microbiology
i) Food Microbiology
ii) Environmental Microbiology
iii) Medical Microbiology

2.9 SCHOOL OF LOGISTICS AND INNOVATION TECHNOLOGY

(I) Department of Entrepreneurship (ENT)
(a) PGD Entrepreneurship
(b) P.h.D Entrepreneurship
(i)Technology Entrepreneurship and Innovation
(ii)Entrepreneurial Finance
(iii) Social Entrepreneurship

(ii) Department of Logistics and Transport Technology
(a) PGD Logistics and Transport Technology
(b) M.Tech Technology Logistics and Transport Technology
(i) Logistics and Air Transportation;
(ii) Logistics and Land Transportation;
(iv) Logistics and Maritime Transportation
(v) Supply Chain Management

(a) P.h.D Logistics and Transport Technology
(i) Logistics and Air Transportation;
(ii) Logistics and Land Transportation;
(iv) Logistics and Maritime Transportation
(v) Supply Chain Management

(iii) Department of Project (PMT)
(a) PGD Project Management Technology
(b) M. Tech.Project Management Technology
(c) P.h.D Project Management Technology
(d) M. Tech in Management Sciences
(e) P.h.D in Management Sciences

2.10 SCHOOL OF PHYSICAL SCIENCES

(i) Department of Chemistry (CHE)
(a) PGD Industrial Chemistry
(b) M. Tech.:
i) Analytical Chemistry
ii) Industrial Chemistry
iii) Environmental Chemistry
(c) Ph. D:
i) Analytical Chemistry
ii) Industrial Chemistry
iii) Environmental Chemistry
iv) Food Chemistry
v) Polymer Chemistry
vi) Organic Chemistry
vii) Inorganic Chemistry
viii) Physical Chemistry

(ii) Department of Mathematical Sciences (MTS)
(a) M. Tech. Industrial Mathematics
i) Dynamics of Structure (Solid Mechanics)
ii) Numerical Methods in Ordinary Differential Equations (ODE)
iii) Fluid Mechanics
iv) Optimal Control
b) Ph. D Mathematics
i) Dynamics of Structure (Solid Mechanics)
ii) Numerical Methods in Ordinary Differential Equations (ODE)
iii) Fluid Mechanics

iv) Optimal Control

(vi) Department of Physics (PHY)
- (a) PGD Physics Electronics
- (b) M. Tech.:
  - i) Condensed Matter Physics
  - ii) Electronic Measurements & Instrumentation Physics
  - iii) Communication Physics
  - iv) Radiation and Health/Medical Physics
  - v) Lower Atmospheric Physics
- (c) Master of Philosophy (M. Phil.)
  - i) Condensed Matter Physics
  - ii) Electronic Measurements & Instrumentation Physics
  - iii) Communication Physics
  - iv) Space Physics
  - v) Atmospheric Physics
  - vi) Radiation and Health/Medical Physics
  - vii) Energy Physics
- (d) M. Phil./Ph.D
  - i) Condensed Matter Physics
  - ii) Electronic Measurements & Instrumentation Physics
  - iii) Communication Physics
  - iv) Space Physics
  - v) Atmospheric Physics
  - vi) Radiation and Health/Medical Physics
  - vii) Energy Physics
- (e) Ph. D:
  - i) Condensed Matter Physics
  - ii) Electronic Measurements & Instrumentation Physics
  - iii) Communication Physics
  - iv) Radiation and Health/Medical Physics
  - v) Lower Atmospheric Physics

(viii) Department of Statistics (STAT)
- (a) PGD Statistics
- (b) M. Tech. Statistics
- (c) Ph. D Statistics
  - i) Econometrics
  - ii) Mathematical Statistics

iii) Operations ResearchIn addition to the above, students for M. Tech and Ph. D degree programmes may conduct research in the following areas:

i) Experimental Design
ii) Multivariate Analysis
iii) Quality Control and Technometrics
iv) Time Series Analysis
v) Sampling Techniques

2.11 Collaboration with Other Research Centres

(i) The University in collaboration with the Regional Centre for Training in Aerospace Surveys (RECTAS), Ile-Ife, Nigeria, offers Master in Geoinformation Technology (MGIT) in the following fields of specialization:
- (a) Disaster Risk Management
- (b) Environmental Management
- (c) Land Resource Management
- (d) Natural Resource Management
- (e) Hydrology and Water Resource Management
- (F) Meteorology and Climate Change
- (g) Soil Analysis and Agricultural Management
- (h) Health and Social Development
- (i) Crime Mapping, Peace and Security and Military Intelligence
- (j) Urban Planning and Analysis
- (k) Geovisualisation and Mapping Technology.

www.rectas.org.

(ii) The University also in collaboration with African Regional Centre for Space Science and Technology Education-English (ARCSSTE-E), Ile-Ife, Nigeria (affiliated to the United Nations), offers Master of Space Science and Technology (MSST) in the following Options/specializations:
- (a) Satellite Communication
- (b) Basic Space Physics
- (c) Satellite Meteorology, and
- (d) Remote Sensing and GIS

www.arcsstee.org.

(iii) West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL)

(iv) Centre for Renewable Energy Technology (CRET)

(v) IInstitute of Tech-Enhanced-Learning and Digital Humanities (INTEDH)

SECTION THREE
ADMISSION AND PROGRAMME DURATION

3.0 General Procedure for Admission into the School of Postgraduate Studies

The procedure for admitting students into the School of Postgraduate Studies is as follows:

(i) About five months to the end of each session, advertisement for admissions for the session that follows is displayed in selected national dailies and in the SPGS Portal on the FUTA website. Candidates access the application form online after making appropriate payment through banks on e-tranzact platform. After the close of applications, the forms submitted by the applicants are downloaded by the Departments and each Departmental Postgraduate Committee shortlists and recommends those candidates found eligible for admission to the Postgraduate Admissions Committee for the final consideration and approval of the Academic Board of Postgraduate Studies. Subsequently, provisional letters of admission are issued to the candidate by the School of Postgraduate Studies.

(ii) On arrival at the University, the student shall present original copies of his/her certificates and other credentials for screening by both the Departmental and the School of Postgraduate Studies. It is after the successful completion of this that the student shall proceed to register on the SPGS portal after payment of the necessary fees and shall then be eligible for Matriculation.

3.1 General Admission Requirements

Generally, presentation of relevant Higher National Diploma (HND) and Bachelor Degree or Postgraduate Diploma with the requisite grade as well as NYSC discharge or exception certificate shall now suffice for admission into postgraduate Diploma and Masters degree programmes of the University, respectively. For M.Phil., M.Phil./Ph.D and Ph.D, relevant Masters' grade and acceptable proposal should be enough to ensure admission into the programmes.

NOTE: Applicants are no longer required to present 'O' level results for admission

3.1.1. Postgraduate Diploma (PGD)

(i) A first degree, not lower than Third Class, in the relevant discipline.

(ii) Higher National Diploma (HND) of at least Lower Credit level or its equivalent in the relevant or related discipline.

(iii) Professional qualifications such as ACA. AIB, ACCA, ACIS or its equivalent are acceptable for Postgraduate Diploma in Computer Science only.

3.1.2 Master of Agric. Technology/Master of Engineering/Master of Technology (M. Agric. Tech./M. Eng./M. Tech.)

(i) A good Bachelor's degree of at least Second Class Lower Division of The Federal University of Technology, Akure, in the appropriate discipline.

(ii) A good Bachelor's degree from other recognized Universities, in the appropriate discipline.

(iii) Higher National Diploma of at least Lower Credit level and in addition to a Postgraduate Diploma (at Upper Credit level) in the appropriate discipline.

3.1.3 Master of Philosophy (M. Phil.); M.Phil./Ph.D

(i) M.Phil candidates must have scored between 50% and 54% or 2.4 – 2.99 at the Masters Degree programme.

(ii) M.Phil/Ph.D: candidate shall have scored between 55% and 59.9% or 3.0 – 3.49 at the Masters Degree Programme.

(iii) For candidates who wish to change to another Department, a Master's Degree from a relevant discipline with a CGPA not less than 3.0 on a 5 point scale or at least a score of 60% is required for M.Phil and M.Phil/Ph.D. They shall in addition take required courses by the proposed Department

NOTE: A CGPA of 2.4 on a 5-point scale minimum shall be required for FUTA graduates admitted from 2016/2017 academic session onward

3.1.4 Professional Masters Degree

(a) Master of Real Estate (MRE) Programme-Professional

Candidate must possess any of the following qualifications in addition to satisfying the general University regulations for admission:

(i) B. Tech in Estate Management with at least Second Class (Honours) Lower Division of the Federal University of Technology, Akure or the equivalent.

(ii) Post graduate Diploma in Estate Management with a minimum of Lower Credit of the Federal University of Technology, Akure or any recognized University.

(iii) Candidates who possess a minimum of Second Class (Honours) Lower Division First Degree in Mechanical Engineering or Production Engineering may be admitted into Facilities Management or Plant and Machinery Valuation option.

(iv) Candidates who possess a minimum of Second Class (Honours) Lower Division First Degree in; Electrical engineering; Building; Architecture; or Quantity surveying may be admitted into Facilities Management option.

(v) Candidates who possess a minimum of a Second Class (Honours) Lower Division First Degree in; Law; Urban and Regional Planning; or Land surveying may be admitted into Land Management option.

3.1.5 Doctor of Philosophy (Ph.D)

(a) Direct Admission

(i) A good Master's degree in the appropriate discipline with a CGPA of 3.50 and/or 60% minimum average score.

(ii) Any other qualification approved by Senate

(b) Admission by conversion

A candidate who enters an M. Phil, M.Phil/ Ph.Dprogramme may convert to Ph.D programme if he/she fulfils the following:

(i) Candidate must have successfully presented at least two seminars: proposal and progress seminars.

(ii) Candidate must have presented a detailed report of research-work done up to the time of seeking conversion and submitted to the School of Postgraduate Studies any relevant published and unpublished materials that can be assessed by the Department.

(iii) Candidate must have completed all course work with CGPA of not less than 3.5 or 60% aggregate score in the M. Phil, M.Phil/Ph.D programme.

(iv) Candidate must have fulfilled all other conditions as approved by the University Senate for admission into a Ph.D programme.

Note: Candidate must obtain and complete Ph.D Conversion Form as appropriate.

3.2 Method of Application for Admission

(i) Candidates should process their application on-line at the University's website: www.futa.edu.ng, www.arcsstee.org, and www.rectas.org using the e-tranzact method with payment made to the School of Postgraduate Studies' account.

(ii) Application forms for Postgraduate programmes are sold at an approved rate, excluding, bank charges.

(iii) Specifically, Ph. D candidates should send their Research Proposal to SPGS_ ADMISSIONS@futa.edu.ng using surname_ School/Dept.doc e.g. *Ojo_sosche.research proposal.*

(iv) Non-FUTA graduates should ensure that the official transcript from their Institutions is directed to the address below (indicating the target department) latest eight (8) weeks from the date of advertisement to the address below:

THE SECRETARY,
SCHOOL OF POSTGRADUATE STUDIES
ATTN: DEPARTMENT OF……..
THE FEDERAL UNIVERSITY OF TECHNOLOGY,
P.M.B. 704, AKURE, NIGERIA.

NOTE: ***Mix-up in username and password by applicants would attract extra charges.***
Error in completion and submission of forms during the process of application would lead to loss of application processing for the academic session (e.g. selecting M.Tech instead of PGD or Ph.D)

3.3 Transcript

(i) Applicants are expected to request their previous institutions to forward transcripts of all degrees, certificates and professional qualifications in properly sealed envelopes, with their application forms.

(ii) Where a candidate's institution fails to provide an official copy to the School (directly), the candidate may enclose along with the application forms the student's copy of the transcript for temporary reference where possible.

(iii) Applicants should therefore make adequate arrangements with their previous institutions to provide transcripts before the stipulated deadline in order to prevent delay.

(iv) FUTA graduates who wish to pursue higher degrees in the University shall not be required to pay for processing of their academic transcripts for admission into the same Department from which they graduated. However, such candidates should apply for their transcripts, which would be processed and forwarded to the Department into which admission is sought.

3.4 Types of Admission

3.4.1 Full-Time Admission

(i) Full-time admission shall be offered only to candidates who convince the School of Postgraduate Studies that they are not working or undertaking full-time studies in the University or elsewhere. In any case, a valid letter of release from the employer shall be required and verified.

(ii) Candidates found to have made a false declaration in this regard shall be asked to withdraw from the University.

3.4.2 Part-Time Admission

(i). Candidates may be admitted to part-time programme (PhD only), if they are members of staff of the University.

(ii). Other candidates applying for part-time registration may be asked to show evidence of consent by their employers (where applicable).

3.4.3 Full-Time Admission with Audited Courses

Full-Time admission may be offered to candidates in Departments related to their course of study at undergraduate level. Such candidates will be required to audit some undergraduate courses to make-up for their deficiencies. The courses to be audited will be recommended by the Department and approved by the Academic Board of SPGS.

3.4.4 Admission of Full-Time Member of Staff

A full-time member of staff or any person engaged in academic work with the University or associated institutions may be admitted into a postgraduate programme, in accordance with the above regulations subject to the following modifications:

(i) the staff member must meet the normal requirements for eligibility for admission into a programme of postgraduate studies in the area of his choice;

(ii) notwithstanding other regulations relating to part-time study, Senate on the recommendation of the Board of the School of Postgraduate Studies, may prescribe a minimum period of study and research;

(iii) where a member of staff who has been a candidate under these regulations ceases to be a member of staff of the University, the candidate shall apply to the Academic Board of the School of Postgraduate Studies, to determine the condition of continuance of candidature; and

(iv) registered Postgraduate student should not hold any position that would compromise academic standard in the University.

3.5 Offer and Acceptance of Provisional Admission

The following conditions are related to admission and registration:

(1) The offer of admission is strictly provisional and may be revoked if:
   (a) you fail to formally accept the offer by paying the acceptance fee of ₦40,000.00 for M.Tech, M.Phil, M.Phil/PhD and PhD; and N10,000.00 for PGD within 2 weeks of notification of admission and other charges within three (3) weeks after payment of acceptance fee;
   (b) you are unable to satisfy the necessary requirements for admission and registration; and
   (c) you cannot produce at the time of registration, the original copies of your certificates, transcripts, NYSC Discharge Certificate and other academic credentials.

(2) If you accept the offer, kindly follow the procedure for registration as stated on SPGS portal: spgs.futa.edu.ng.

(3) You are to pick the screening form from the department and proceed to SPGS with the signed screening form for further screening procedures before payment of fees.

(4) It is mandatory that you appear in person for clearance at the Admissions Office of the School of Postgraduate Studies latest a week before the date of matriculation which shall be announced. **Please note that the offer will be revoked and your slot given to someone else, if within six weeks from the date of the letter you have neither (i) completed and returned the printed acceptance forms nor (ii) submitted the originals of your credentials for clearance.**

(5) Payment of all fees must be made immediately, after completing screening exercise as provisional offer of admission may lapse thereafter.

(6) **It is mandatory to complete necessary procedures of registration into the session within three (3) weeks of the beginning of the academic session and renew your registration at the beginning of every session until you finally complete the programme. Late registration after the third week of commencement of the session (if permitted) will automatically attract penalty.**

(7) It is mandatory for all candidates to attend the Induction Programme and the Matriculation Ceremony as sanctions for not attending the Programmes may include withdrawal of admission, among other penalties. The date and venue will be announced later on the SPGS Portal, FUTA website.

(8) For International students, when applying for entry permit or visa, you may be requested to furnish the office of the Director-General, Federal Ministry of Internal Affairs, Abuja with the following items of information to accelerate the processing of your application.
   (a) Your nationality
   (b) Date and place of birth
   (c) Passport number, date and place of issue
   (d) Validity of passport
   (e) Anticipated length of stay at the Federal University of Technology, Akure
   (f) Sponsorship

It is important to note that a residence permit is necessary for the confirmation of an offer of admission. You may contact the Director, International Office of this University for further assistance (imosadeyi@futa.edu.ng; io@futa.edu.ng)

(9) The information on fees payable is available on SPGS Portal for your further action.

PLEASE NOTE:

- **Acceptance fee, once paid, is not refundable.**
- **Please note that if it is discovered at any time that you do not possess any of the qualifications which you have listed to have obtained, the admission will be withdrawn immediately.**

3.6 Deferment of Admission

In order to qualify for deferment of admission, students must;

i) have the prerequisite qualifications for admission to the School/Department and course;

ii) have paid all fees and be duly registered;

iii) have been matriculated and assigned a matriculation number; and

iv) apply and get a response on his application

It should be noted that every application shall be considered on its merit.

3.7 Admission by Transfer to the University

Admission by transfer into the University shall not normally
be encouraged

3.8 Program Duration/Validity Period

3.8.1 Postgraduate Diploma Programme

(i). Department running PGD for:
- (a) two semesters shall spend between 12 and 18 months;
- (b) three semesters shall spend between 18 and 24 months; and
- (c) four semester shall spend between 24 and 36 months

(ii). Candidates whose studentship has expired under the regulations shall not be registered unless they have been granted waivers or extension (re-activation) as appropriate by the Academic Board of SPGS.

(iii). Candidates shall not be registered at the expiration of the extension granted by the Academic Board of SPGS.

3.8.2 Masters' Programmes

(i). Full-time students shall normally spend between eighteen (18) and twenty-four (24) months.

(ii). Part-time students shall normally spend between twenty-four (24) and thirty six (36) months.

(iii). At the expiration of 18 and 24 months for full-time and part-time students respectively, the Academic Board of SPGS, on behalf of Senate may approve an extension of up to a maximum of six (6) months. At the expiration of the extension, such student is deemed to have forfeited the admission by losing his/her studentship.

3.8.3. M.Phil. & M.Phil./PhD Programmes

(a) M.Phil
- (i) The Master of Philosophy Programme shall be a Full-Time programme.
- (ii) Students shall normally be required to spend between twelve (12) and eighteen (18) months.
- (iii) A candidate may transfer from M. Phil. to Ph.D programme after completing the course- work and fulfilling all other APPROVED Requirements

(b) M.Phil./Ph.D
- (i) M.Phil/Ph.D programme shall be on Full-Time basis.
- (ii) The duration for M.Phil/Ph.D. programme shall be 12 to 18 months and candidates who fail to meet the minimum requirement for conversion to Ph.D shall terminate the programme at the M.Phil level.
- (iii) The final oral examination shall follow the same procedure as for the M.Phil oral examination.

3.8.4 Doctor of Philosophy (Ph.D) Programmes

(i). Full-time students shall normally defend their theses between thirty-six (36) and forty eight (48) months, while

(ii). Part-time candidates shall normally defend their theses between forty-eight (48) and sixty (60) months

(iii). At the expiration of 36 and 48 months full-time and part-time students respectively, the Academic Board of SPGS may, on behalf of Senate, approve extension of up to a maximum of twelve (12) months. At the expiration of the extension, a student is deemed to have forfeited the admission by losing his/her studentship.

(iv) A Ph.D candidate shall be required to present an approved research proposal in the Department within six months after registration for full-time student; and within twelve (12) months for part-time students.

3.8.5 Validity of studentship

Candidates whose studentship has expired under the regulations stated above shall not be allowed to register forthwith. The Secretary, SPGS shall compile the list of students whose studentship had expired at the beginning of every session. List of students whose studentship had expired shall be considered and approved by the Academic Board and ratified by the University Senate not later than two months at the beginning of every Session and communicate same to the affected students.

CAVEAT: WHERE THERE IS/ARE CONFLIT(S) BETWEEN DEPARTMENTAL PUBLISHED RULES AND REGULATIONS GUIDING SPECIFIC PROGRAMME AND THE SENATE DECISION(S), THE SENATE DECISION WILL OVERRIDE THE DEPARTMENTAL RULES AND REGULATIONS.

SECTION FOUR
REGISTRATIONS, MATRICULATION AND WITHRAWAL FROM THE UNIVERSITY

4.1 Procedure for Registration
Registration procedure shall be as announced through the SPGS portal at the beginning of every academic session

4.2 Late Registration
Late registration shall be accepted only with the permission of the Dean, School of Postgraduate Studies and on the payment of the prescribed penalty fee which will be reviewed from time to time.

4.3 Matriculation and Induction Exercises
The Matriculation Exercise and Induction for the Students of the School of Postgraduate Studies takes place about one month after registration, usually in line with approved academic calendar.

4.4. Verification of Results
The verification of results of registered candidates shall be carried out before graduation from the programme

4.5 Thesis Title Registration
4.5.1 Masters' Programmes
Full-time student shall normally be required to commence the process of thesis title registration after a minimum period of 12 months into the Master degree programme.

4.5.2 M.Phil. Programmes
M.Phil. student shall normally be required to commence the process of thesis title registration after a minimum period of 12 months into the programme.

4.5.3 M.Phil./Ph.D Programmes
M.Phil./Ph.D student who is unable to proceed to Ph.D programme shall normally be required to commence the process of thesis title registration after a minimum period of 12 months into the programme.

4.5.4 Doctor of Philosophy (Ph.D) Programmes
(i) Full-time student shall commence the process of thesis title registration after a minimum period of 30 months into the programme.

(ii) Part-time student shall commence the process of thesis title registration after a minimum period of 42 months into the programme.

4.6 Withdrawal from the University
i) A student may be asked to withdraw:
   (a) if his/her academic performance is not satisfactory;
   (b) on grounds of ill-health;
   (c) on grounds of misconduct; and
   (d) failure to register as and when due

ii) A student may also voluntarily withdraw his/her studentship;

iii) A student who fails to register for two consecutive semesters shall be deemed to have voluntarily withdrawn his/her studentship.

iv) A student who fails to complete the programme within the approved duration of the programme of study shall be deemed to have voluntarily withdrawn his/her studentship.

Note: Please refer to duration of study for the relevant programme.

4.7 Request for Temporary withdrawal
A student with genuine reason(s) may apply for temporary withdrawal for a maximum of one academic session. Such a student is expected to write to the Academic Board of Postgraduate School for approval. The period of temporary withdrawal shall not be counted for the period of study.

4.8 Request for Split Site Programme
A student on split site programme shall inform the Academic Board of Postgraduate Studies on the duration of stay outside the University. The duration of stay shall count towards the award of the degree.

SECTION FIVE
POSTGRADUATE TEACHING, SUPERVISION AND EXAMINATIONS

5.1. Eligibility to Teach Postgraduate Courses

(i). Only the following categories of staff shall normally be eligible to teach postgraduate courses:

(a) Persons with a doctorate degree and with a minimum of one year of teaching and research experience (Lecturer II) at the University or Research Institute,

(b) In particular for postgraduate diploma programme, Lecturers with a good first degree and master's degree with research and teaching experience and NOT lower than Assistant Lecturer grade, provided he/she is not a Postgraduate student in the University can teach Postgraduate Diploma courses.

(ii). In pursuance of Regulation 5.1(i) above, each SPGAC shall on recommendation of the appropriate Department, submit for approval of the Board at the beginning of each academic session, the list of eligible staff to teach postgraduate courses (Masters, M.Phil and PGD programme separately).

(iii). The Board in pursuant to relevant Regulation, may refuse to approve course (s) of study if it is convinced that the available teaching staff is inadequate under the regulations.

5.2 Supervision of Master's Dissertation and Doctoral Thesis

5.2.1 Eligibility to Supervise Master Dissertation and Doctoral Thesis

(i) Professors in relevant fields.

(ii) Senior Lecturers and above, with Ph.D can be major supervisors for Master's dissertation and Ph.D thesis

(iii) Lecturer I with Ph.D or Lecturer II with Ph.D plus three (3) years post-qualification teaching experience can co-supervise Ph.D and be major supervisor for Master's dissertation.

(iv) All major supervisors shall be staff of the department who specializes in the area of the research interest of the student.

(v) In case a student from the University has an external supervisor, such supervisor must be acquainted with the University's regulation on details including duration of its postgraduate programmes.

(vi) All co-supervisors appointed from Research institute/ Industries shall have a minium of 2 years post Ph.D experience .

(vii) For supervision of master's dissertation, a co-supervisor is recommended to further strengthen the quality of the thesis.

(viii) Where a recommended Co-Supervisor is from another University/research institute/industry, the Head of Department shall normally seek the approval of the Academic Board of Postgraduate Studies for the appointment of such Co-Supervisor.

(ix) Normally, for a Ph.D candidate there shall be at least one Co-Supervisor for the student. The Co-Supervisor(s) should be in relevant fields to the student's research and may come from other departments in the School or from other Schools in the University or from another University.

5.2.2 Roles of Supervisors

(i) The supervisors shall advise and train the candidate in the research methods and guide him/her in writing his/her project report or thesis.

(ii) Request to change supervisor(s):

(a) Any request for change of supervisor originating from the Department, must be made in writing. Such request shall normally be addressed to the Dean, School of Postgraduate Studies and routed through the appropriate Departmental and School Postgraduate Advisory Committee.

(b) In a case where the supervisor is the Head of Department, the candidate shall route his/her request through the Chairman of the School Postgraduate Advisory Committee to the Dean, SPGS.

(c) Where the major supervisor has disengaged from the services of the University, the departmental Postgraduate committee shall recommend a new major supervisor for the student to the Academic Board of Postgraduate Studies through the Dean,SPGS.

(d) Where the disengaged major supervisor has been offered appointment as Adjunt supervisor (contract staff, Adjunt Professor/ Lecturer) in the University, the procedure in (c) above shall be followed for approval in order to continue as major supervisor. The Adjunct Supervisor shall be entitled to the approved supervision honorarium per session.

(e) In a case where the major supervisor is on leave of absence from the University for a period exceeding 12 calendar months, the Postgraduate Departmental Committee shall shall recommend a new major supervisor for the student to the Academic Board of Postgraduate Studies through the Dean,SPGS.

(e) A supervisor shall not be changed unless due processes are followed as specified above.

5.3 Mode of Examinations

(i) Courses shall be assessed by means of oral/ practical and written examination(s) as may be specified.

(ii) No candidate shall be permitted to sit for the prescribed examination(s) until such candidate has:
- (a) appropriately registered for the course (s) leading to the examinations, and paid all prescribed fees for the course(s),
- (b) satisfied the minimum attendance of 65 percent of lectures in each course, and
- (c) satisfactorily fulfilled all other approved University, School or Departmental requirements for the programme of study.

5.3.1 Approved Grading System

Pass mark for all Postgraduate programmes shall be 50% with effect from 2015/2016 academic session without prejudice to those who are already running their postgraduate programmes. The approved grading system is as follows:

(i) CGPA Grading System

4.5	-	5.00
3.50	-	4.49
2.40	-	3.49
1.50	-	2.39
1.00	-	1.49
< 1.00	-	0

(ii) Percentage Grading System

70% and above		
60%	-	69%
50%	-	59%
45%	-	49%
40%	-	44%
0%	-	39%

Note: This is to start from the set of students that would be admitted in 2016/2017 academic session.

This grading system will not be applicable to students that graduated from FUTA prior to the commencement of the new grading system.

The transcript shall indicate the qualification of the grade whether candidate is qualified to proceed on higher degree or not.

(iii) Revised Classification of Master's Grades from 2016/2017 Academic Session

The Master's grade shall be classified to make it specific. It will be classified as follows:

i. M. Phil grade shall be 50 – 54.9% or 1.5 – 2.39 CGPA on a 5.0 grading system.

ii. M.Phil/Ph.D grade shall be 55-59.9% or 2.4 – 3.49 CGPA on a 5.0-point grading system.

iii. The Ph. D grade shall be minimum of 60% or 3.50 CGPA.

5.3.2 Board of Examiners

(i) For each programme, there shall be a Board of Examiners consisting of:
- (a) The Head of Department, who shall be the Chairman and Chief Examiner, and
- (b) Examiners for each course.

(ii) The result of the examination for each semester shall be submitted by the appropriate Department to the Academic Board of School of Postgraduate Studies for recommendation to Senate for approval not later than four (4) weeks after the Semester Examinations.

5.3.3 Examinations and Examiners

All students shall take and pass the prescribed examinations at the end of the first and second semesters.

(i) For PGD Project Report defense, the Panel of Examiners shall consist of:
- (a) the Head of the Department who shall be Chief Examiner and Chairman of the panel;
- (b) Departmental PGD Coordinator; and
- (c) an External Examiner

(ii) For the M. Agric. Tech., M.TecM., M. Arch., M. Eng., M.Phil., and M. Phil./Ph.D thesis, the Panel of Examiners shall consist of:
- (a) the Head of Department who shall be Chief Examiner and Chairman of the panel;
- (b) the candidate's supervisor(s);
- (c) Representative of the Academic Board of School of Postgraduate Studies;
- (d) Sub Dean (masters) who reads the guidelines for the conduct of the examination; and
- (e) an External Examiner.

(iii) For the Ph.D programme, the Panel of Examiners shall consist of:
- (a) the Head of Department who shall be the Chief Examiner and the Chairman of the Panel;
- (b) the candidate's supervisors (minimum of two - a major and at least one co-supervisor)
- (c) at least one person representing the Academic Board of School of Postgraduate Studies;
- (d) Sub Dean (Ph.D) who reads the guidelines for the conduct of the examination; and
- (e) an External Examiner.
- (f) In a case where the chief examiner is one of the candidate's supervisor, the ABPGS shall appoint other school examiner for the candidate.

(iv) Appointment of External Examiners
- (a) The supervisors (major and Co) shall normally nominate two external examiners: One substantive and the other alternate for approval of Senate through the ABPGS.

(b) Any external examiner must not be a staff of the University and, in case he/she has been on sabbatical in the University, must have two years post sabbatical experience.
(c) The external examiner should be in the relevant area of the research work.
(d) The two nominated examiners should not be from the same University

5.3.4 Open Examination of Thesis

5.3.4.1 Audience

Open examination of thesis shall be applicable to Ph.D programme only. The following categories of persons and agencies should be invited to the examination venue:

(i) members of the Panel of Examiners approved by Senate.
(ii) lecturers in the candidate's Department and the University community;
(iii) Postgraduate students in the candidate's Department;
(iv) all stakeholders including members of the University community and related agencies outside the University.

5.3.4.2 Conduct of the Examination

(i) there, shall be visual presentation with audio visual aids;
(ii) a candidate shall spend not more than thirty (30) minutes to make his/her presentation;
(iii) only the Panel of Examiners, led by the External Examiner, shall pose questions to the candidate;
(iv) the period to be spent on the Question and Answer Session shall be at the discretion of the Panel of Examiners;
(v) based on the presentation, the External Examiner shall moderate the comments and interactions segment within twenty minutes;
(vi) at the end of the Question and Answer Session, the invitees shall leave the examination venue;
(vii) the Panel of Examiners shall examine the thesis and point out the corrections to be made to the candidate (where applicable);
(viii) the candidate shall leave the examination venue, while the Panel of Examiners deliberate and take its decision on the performance of the candidate;
(ix) the candidate and the available invitees shall come back into the examination venue and the result of the Oral Examination shall be announced publicly; and
(x) the Examiners' Report shall be forwarded to the School of Postgraduate Studies by its representative within two (2) working days.
(xi) For master's oral examination, at the discretion of the External Examiner, the candidate can make use of visual presentation with audio visual aids. The candidate shall however be informed ahead.
(xii) For M.Phil and M.Phil./Ph.D oral examination, the candidate shall make use of visual presentation with audio visual aids.

See: Agenda for the Conduct of M.tech Oral Examination (Page 21)
Agenda for the Conduct of Phd Oral Examination (Page 22)

THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE SCHOOL OF POSTGRADUATE STUDIES
AGENDA FOR THE CONDUCT OF M.TECH ORAL EXAMINATION (VIVA VOICE)

NAME……

MATRIC NO. ……..

DATE AND TIME: ……

THESIS TITLE:

1. Commencement
2. Chairman's (HOD, Candidate's Department) Opening Remarks to include:
   - *i. Introduction of members*
   - *ii. Ask a germane question: Whether thesis is Examinable?*
     from Chairman to External Examiner
   - *iii. And get a declaration to the effect in (ii) above*
   - *iv. Another round of introduction when the candidate in invited* - 5 minutes
3. Candidate is handed over to the External Examiner
   and required to speak to his/her thesis/visual presentation
   by the Candidate - 15 minutes
4. Examination of the Thesis, pointing out the corrections to be made
   to the candidate by the External Examiner. - 30 minutes
5. Questions/Remarks form other members of the Panel, Internal Examiner
   and Representatives of the Postgraduate School - 15 minutes
6. The student leaves the examiners for decision to be taken. - 15 minutes
7. External Examiner/Chairman Concluding Remarks to the Student - 5 minutes
8. Closing/Adjournment - 5 minutes
9. Photography Session

Total Duration 1:30 minutes

NOTE:

THE EXTERNAL EXAMINER IS AT LIBERTY TO ALTER DURATION OF EXAMINATION, PLEASE

THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE SCHOOL OF POSTGRADUATE STUDIES
AGENDA FOR THE CONDUCT OF PHD ORAL EXAMINATION (VIVA VOICE)

NAME……

MATRIC NO. ……..

DATE AND TIME: ……

THESIS TITLE:

1. Commencement
2. Chairman's (HOD, Candidate's Department) Opening Remarks to include:
   - *i. Introduction of members*
   - *ii. Ask a germane question: Whether thesis is Examinable?*
     from Chairman to External Examiner
   - *iii. nd get a declaration to the effect in ii above*
   - *iv. nother round of introduction when the candidate in invited* - 5 minutes
3. Candidate is handed over to the External Examiner - 5 minutes
   and required to speak to his/her thesis/visual presentation
   by the Candidate - 30 minutes
4. Questions/Remarks form the Panel of Examiners - 15 minutes
   Part b (In House) People leave the examination hall 5minutes - 5 minutes
5. Examination of the Thesis, pointing out the corrections to be made
   to the candidate by the External Examiner. - 30 minutes
6. Questions/Remarks form other members of the Panel, Internal Examiner
   and Representatives of the Postgraduate School - 15 minutes
   The student exits the exam hall for decision to be taken by the
   Panel of Examiners - 10 minutes
7. External Examiner/Chairman Concluding Remarks to the Student - 5 minutes
8. Closing/Adjournment - 5 minutes
9. Photography Session

Total Duration 2:05 minutes

NOTE:

THE EXTERNAL EXAMINER IS AT LIBERTY TO ALTER DURATION OF EXAMINATION, PLEASE

5.3.4.3 Examiners' Report for the Degree of M.Tech, Mphil, Mphil/Ph.D and Ph.D

The tamplate of Examiners' report for the degree of M.Tech., M.Phil, M.Phil/Ph.D and Ph.D is as presented below:

THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Form PGS/ER/2017

SCHOOL OF POSTGRADUATE STUDIES
EXAMINERS' REPORT FOR THE DEGREE OF M.TECH, MPHIL, MPHIL/PHD AND PHD

Part A - General Information

1. Surname of Candidate:.....
(*in block letters*)
2. Other Names in Full:.....
3. Matriculation Number:.....
4. Faculty:.....
5. Department:.....
6. Degree in View:.....
7. Date of First Registration (dd/mm/yyyy):.....
8. Extension with Date(s) (Attach Letters of Approval):.....
.....
9. Title of Thesis:.....
.....

PART B - Course Work (if applicable)

10. Results:.....
11. Remarks.....
.....

PART C - Thesis Evaluation

Excellent = 5; Very Good = 4; Good = 3; Fair 2; Poor =1; Very Poor =0

Numbering	Criteria	Score	Comments (if any)
A	**Abstract**		
	• Appropriate (Well written)		
	Sub-Total (5 marks maximum):		
B	**Formulation/Statement of the Problem(s)/ Rationale/ Justification**		
	• Well written		
	Sub-Total (5 marks maximum):		
C	**Research goal/Hypotheses/Question(s)**		
	• Well stated and Relevant		
	Sub-Total (5 marks maximum):		
D	**Aim(s)/Objective(s)/Purposes(s)**		
	• Clear and Relevant		
	• Achievable		
	Sub-Total (5 marks maximum):		
E	**Literature Review**		
	• Relevant and Current		
	• Authoritative source		
	• Correct interpretation		
	• Critical appraisal of literature		
	• postulation Appropriate theoretical /conceptual framework		
	Sub-Total (5 marks maximum):		

F	**Research Methodology**		
	•□ Logically derived from objective(s)		
	•□ Appropriate choice of design		
	•□ Relevant research instrument(s)		
	•□ Relevant Method of Data Collection		
	Sub-Total (5 marks maximum):		
G	**Results**		
	•□ Accurate Data Analysis		
	•□ Accurate Interpretation of analyzed Data		
	•□ Findings Well Identified/Engineering Design Considerations		
	Sub-Total (5 marks maximum):		
H	**Discussion and Conclusions**		
	•□ Clear Discussion and Logical Comments		
	•□ Discussion connected to the Literature		
	•□ Proper conclusions drawn		
	•□ Conclusions substantiated		
	•□ Contributions to Knowledge and Implication for scholarship identified		
	Sub-Total (5 marks maximum):		
Numbering	**Criteria**	**Score**	**Comments (if any)**
I	**Recommendations**		
	•□ Relevance to the significance/rationale of the study		
	•□ Relevance to research findings		
	•□ Suggestion for further research (relevance to the limitations/scope of the study)		
	Sub-Total (5 marks maximum):		
J	**Structure, Language and Style of Thesis**		
	•□ Logical Organization of Ideas		
	•□ Correct grammar		
	•□ Scientific/academic style		
	•□ Clarity of ideas		
	Sub-Total (5 marks maximum):		
K	**Referencing/Bibliographic Method**		
	•□ Appropriate citation within the text		
	Sub-Total (5 marks maximum):		
L	**Originality, Creativity and Publishability**		
	•□ Responsibility for Statement		
	•□ Problem solving/Value adding contributions		
	•□ Publishability of the findings as identified in the thesis		
	Sub-Total (5 marks maximum):		
	Total for Part C(60 marks)		

Part D – Student's Oral Presentation

S/N	Criteria	Score	Comments (if any)
1.	Comportment		
2.	Composure		
3.	Student's ability to communicate his/her subject and to defend the research appropriately		
4.	Evidence of original and critical thought, depth and breadth of knowledge to the field of study		
5.	General knowledge of the subject matter		
6.	Candidate's expertise with respect to relevant methodologies and techniques		
7.	Student's response to questions		
	Sub-Total for Part D 40 marks		

Total Marks Obtainable: 100

Part E - Recommendation

Contribution of the work to knowledge and scholarship:

To receive Recommendation (A):
Student must score 80-100, (B): 70-79, (C): 65-69, (D): 60-64, (E): 55-59, (F): 50-54, (G): 0-49

(A) Accepted with Distinction A thesis accepted with distinction when all or most of the research findings have either been published or accepted for publication in citation-indexed journals, and requires minimal improvements in language only.
(B) Accepted with Minor Modification A thesis accepted with minor modifications if it requires any of the following: reformatting of chapters, revision of literature, improvement in the declaration of research objectives or statements, insertion of missing references, amendment of inaccurately cited references, and other minor improvements including language.
(C) Accepted with Major Modification A thesis is accepted with major modifications if it requires any of the following *but not additional experimental work or data collection:* extensive revision of the entire thesis to improve quality such as major improvement in description of methodology, statistical re-analysis of research data, removal of research chapter(s), and re-discussion of the results, including improvements in language. The examiner may recommend that the student seek the assistance of an editing service if language errors are extensive.
(D) Oral Re-examination (Re-viva voce) A thesis can be recommended for a second and final oral re-examination (re-viva voce)to be conducted within sixty (60) days after the date of the first viva voce.
(E) Re-submission of Thesis A thesis should be recommended for re-submission if it does not meet the scope of the degree for which it is intended, the objectives of the research are not met and/or when there are obvious flaws in the experimental design and /or methodology, and therefore, *requires additional experimental work or data collection.*
(F) Re-submission of a Masters Thesis A thesis can be recommended for re-submission to be accepted for the award of a Masters degree if the thesis does not meet the scope of a doctoral thesis but is adequate for a Masters degree. All amendments recommended by the Thesis Examination Committee must be made and the thesis resubmitted to the School for examination as a Masters thesis within 60 days of the viva voce.

(G) Rejection of Thesis (Fail)

A 'Fail' status is given if the thesis fails to meet the requirements of a PhD or Masters academic level or found to have been plagiarized.

Panel's Comments:

Panel's Recommendation for the Award of degree: **Yes** ☐ **No** ☐

Names and Signatures of Examiners:

S/N	DESIGNATION	NAME	SIGNATURE	DATE
a.	Chief Examiner			
b.	Major Supervisor			
c.	Co-Supervisor: (i)			
	(ii)			
d.	Other School Examiners: (i)			
	(ii)			
e.	Representative of SPGS			
f.	External Examiner(s)			

SECTION SIX
PRESENTATION OF THESIS/DISSERTATION/PROJECT REPORT

The standard format for the thesis/dissertation/project report to be submitted to the School of Postgraduate Studies shall be as follows:

6.1. The Cover of the Thesis/Dissertation/Report

i. The colour shall be deep purple for all Postgraduate programme Reports, Dissertations and Theses.

ii. The titles of the Reports, Dissertations and Theses shall be written in full capital letters including biological name, but the latter name (shall be italicized).

iii. The name of the candidate shall be written in full: surname first, followed by other names.

iv. The year of defense shall be written at the bottom right corner on the cover.

v. The spine shall bear (from bottom to top side) the surname and initials of the candidate, the programme and year of the submission of the research/thesis.

vi. Candidate is required to submit two bound and electronic (PDF format) copies to the SPGS

vii. Recommended font type and size is as specified below:

- Font type Times Roman
- Font Size 12
- Spacing Double line
- Justification Paragraphing style

viii. The sample of the cover of the Report/ Dissertation / Thesis should be in the format shown in Fig.1:

DEVELOPMENT AND PERFORMANCE OF OPTIMIZATION OF OIL SPILLAGE REMEDIATION MACHINE

BY

BALOGUN, SIKIRU OLADELE

(MEE/99/3480)

AUGUST,2017

Fig. 1: The sample of the cover of Thesis/ Dissertation/Report

6.2. Title Page

i. The titles of the theses and names of candidates shall be written as on the cover.

ii. The candidate's previous degree(s) and matriculation number shall come under the names.

On the same page, under the name, the following shall also be written:

A thesis in the Department of ……., School of ……. submitted to the School of Postgraduate Studies, in partial fulfillment of the requirements for the award of ……. in ……. of the Federal University of Technology, Akure, Nigeria (see Fig. 2).

DEVELOPMENT AND PERFORMANCE OF OPTIMIZATION OF OIL SPILLAGE REMEDIATION MACHINE

BY

BALOGUN, SIKIRU OLADELE

B.Eng, M.Eng (MEE/99/3480)

A Thesis/Dissertation/Project (see section 6.15) in the Department of Mechanical Engineering and Engineering Technology, School of Engineering and Engineering Technology submitted to the School of Postgraduate Studies in partial fulfillment of the requirements for the award of Doctor of Philosophy in Mechanical Engineering (Production Engineering Option) of The Federal University of Technology, Akure, Nigeria

August, 2014

Fig. 2: Title Page

6.3. Declaration Page

The Declaration Page contains a statement by the student on the originality of the work reported in the Thesis/ Dissertation/Project and acknowledgement of sources of information utilized, according to the format below (see Fig. 3).

DECLARATION

I hereby declare that this Thesis was written by me and is a correct record of my own research work. It has not been presented in any previous application for any degree of this or any other University. All citations and sources of information are clearly acknowledged by means of references.

Candidate's Name: BALOGUN, SIKIRU OLADELE

Signature:…….. Date:……

Fig. 3: Samole of Declaration by Student

I hereby declare that this Thesis/Dissertation/ Project was written by me and is a correct record of my own research work. It has not been presented in any previous application for any degree of this or any other University. All citations and sources of information are clearly acknowledged by means of references

Candidate's Name: .....
Signature: ..... Date: .....

6.4. Certification page

The Certification Page contains a statement of approval of the Thesis/Dissertation/Project in line with the appropriate University regulations and is signed by the Major Supervisor and Co-Supervisors according to the following and as shown in Fig. 4

We certify that this Thesis/Dissertation/Project entitled "....." is the outcome of the research carried out by ..... in the Department of .....of the Federal University of Technology, Akure.
Major Supervisor's Name:.....
Signature: ..... Date: .....
Co- Supervisor's Name: .....
Signature: ..... Date: .....
Co- Supervisor's Name:.....
Signature: ..... Date: .....
***NOTE: Where there is an external supervisor, the external supervisor if available at the oral examination shall be a signatory on the certification page.**

CERTIFICATION

We certify that this Thesis/Dissertation/Project entitled "Development and Performance of Optimization of Oil Spillage Remediation Machine" is the outcome of the research carried out by Balogun, Sikiru Oladele in the Department of Mechanical Engineering, The Federal University of Technology, Akure.

Major Supervisor's Name:.....

Signature: ..... Date: .....

Co-Supervisor's Name:.....

Signature: ..... Date: .....

Co-Supervisor's Name:.....

Signature:.....Date:.....

Fig. 4: Certification Page

6.5. Acknowledgment Page

The acknowledgement page is for giving credit to all those who played significant roles in support of the study or the student during the course of study, research and write-up (see Fig. 5).

ACKNOWLEDGEMENTS

I am grateful to my Major Supervisor, Dr. ..... his encouragement and constructive criticism throughout the conduct of this research. My sincere gratitude also goes to .....

Fig. 5: Sample of Acknowledgements

6.6. Dedication Page

The Dedication is optional and could come after the Acknowledgement page. It should generally be short in length and convey the message in a concise manner. See Fig. 6 for sample.

DEDICATION

This Thesis/Dissertation/Project is dedicated to my aunt, Madam , for her love and encouragement at all times and without whose financial support this study would not have been possible

Fig. 6: Sample of Dedication Page

6.7. Abstract

Each Thesis/Dissertation/Project is expected to contain an abstract of not more than 500 words displayed immediately after the Certification page. This should report in a concise manner the objectives of the research, the method, findings and conclusions. It should be in a form suitable for direct use by international abstracting services and should not be paragraphed.

6.8. Table of Contents

The Table of Contents is very important as it provides an insight into the organization of the whole Thesis/Dissertation/ Project. It should therefore be carefully compiled. To aid quick comprehension, listing of sub-sections should be indented from sections as shown in Fig.7.

6.9. List of Tables

All the tables in the Thesis/Dissertation/Project must be serially numbered and a table compiled to show their page location within the text as indicated in Fig. 8.

6.10 List of Figures

All the figures in the Thesis/Dissertation/Project must be serially numbered and a table compiled to show their page location within the text as indicated in Fig. 9.

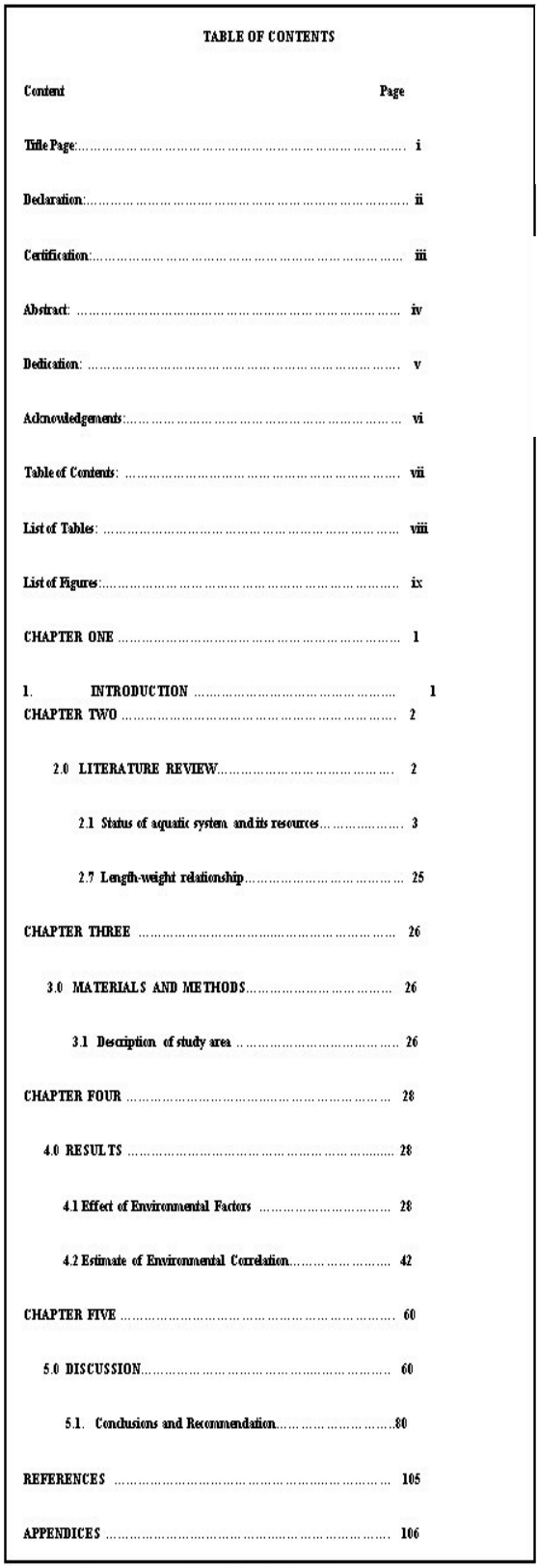


TABLE OF CONTENTS

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Abstract: iv

Dedication: v

Acknowledgements: vi

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1. INTRODUCTION 1

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2.7 Length-weight relationship 25

CHAPTER THREE 26

3.0 MATERIALS AND METHODS 26

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CHAPTER FOUR 28

4.0 RESULTS 28

4.1 Effect of Environmental Factors 28

4.2 Estimate of Environmental Correlation 42

CHAPTER FIVE 60

5.0 DISCUSSION 60

5.1. Conclusions and Recommendation 80

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Fig. 7: Sample of Table of Contents

LIST OF TABLES

Table		Page
1.	Range of .....Literature	8
2.	Estimates of .....from literature	15
3.	Summary of analyses of environmental effects	45

Fig. 8: Sample of List of Tables

LIST OF TABLES

Table		Page
1.	Range of .....Literature	8
2.	Estimates of .....from literature	15
3.	Summary of analyses of environmental effects	45

Fig. 9: Sample of List of Figures

6.11 List of Plates

All the figures in the Thesis/Dissertation/Project must be serially numbered and a table compiled to show their page location within the text as indicated in Fig. 10:

LIST OF PLATES

Plate		Page
1.	Photomicrograph of.....18	
2.	Maize of different 60	

Fig. 10: Sample of List of Plates

6.12 Outline of Thesis/Dissertation/Project

The following two options (A and B) shall be the outline of thesis/dissertations:

6.12.1. Option A

Chapter One: Introduction
Chapter Two: Literature Review
Chapter Three: Materials and Methods/ Methodology
Chapter Four: Results
Chapter Five: Discussion
Chapter Six: Conclusion and Recommendations

NOTE: Reference List shall follow immediately after Chapter Six. Then the appendices can follow.

6.12.2. Option B

The following shall be the outline of thesis/dissertations:

Chapter One: Introduction
Chapter Two: Literature Review
Chapter Three: Materials and Methods/ Methodology
Chapter Four: Results and Discussion
Chapter Five: Conclusion and Recommendations

NOTE: Reference List shall follow immediately after Chapter Five. Then the appendices can follow

6.13 Appendix

When appendices are included in the thesis/dissertation/ project, they should also be numbered serially and a table compiled to show their page location within the text. Unless references are made to them in the body of the work, appendices may not be necessary.

6.14 Originality of Thesis/Dissertation/Project

The thesis/dissertation/project of a candidate may not include materials already submitted for the award of a degree in any other University, and shall not be part of a previous thesis/ dissertation/project for a higher degree of the Federal University of Technology, Akure.

A candidate shall not be qualified for the award of a Postgraduate Diploma, Masters or Doctorate Degree until he has passed all the prescribed courses (where applicable), submitted a satisfactory thesis/dissertation/project, passed his oral examination and spent not less than the minimum number nor more than the maximum number of semesters as stipulated for the programme.

6.15 Nomenclature of Research Reports

In The Federal University of Technology, Akure, the nomenclature for Postgraduate Diploma, Masters and Ph.D research treatises shall be Project, Dissertation and Thesis respectively.

6.16 Preparation of Thesis/Dissertation/Project

In preparing Thesis/Dissertation/Project, students should take note of the following:

(i) The title of the Thesis/Dissertation/Project should not be more than 18 words.

(ii) The abstract should not be more than 500 words and should not be paragraphed.

(iii) Every table, figure and plate must come immediately after it is mentioned on the next page; and there must be one table/figure/plate per page. Title of Table should be at the top of the table while title of figures and plate should be at their bottom.

(iv) Tables/figures/plates must be numbered on chapter basis continuously e.g. Table 1.1, Table 1.2,etc for tables in Chapter 1 and Table 2.1, Table 2.2, etc for tables in Chapter 2, etc.

(v) Tables/figures/plates are not to be cited in the discussion.

(vi) In situations where structural formulae are required, they shall not be denoted as Figures and thus can appear between adjoining paragraphs.

(vii) All plates (photographs) shall be printed in full colour except in cases where that negates the information being provided.

(viii) Tables must be simple and understandable. There shall not be cross lines or shading within the table.

6.17 Standard and Presentation of Thesis/ Dissertation/Project

(i) In accordance with Regulation 5.2.2(i), a thesis/ dissertation/project shall be prepared under the direction of a supervisor(s) nominated by the Departmental Postgraduate Committee for the approval of the Academic Board.

(ii) The thesis/dissertation/project must be a connected piece of work which may comprise a series of chapters on related topics, provided that these are accompanied by an adequate explanation of their relationship to each other and to the wider context of the subject.

(iii) A candidate may not include in the thesis/ dissertation/project any material presented in fulfillment of the requirements for any other degree or professional qualification in this or another University

(iv) A thesis/dissertation/project must be the candidate's original contribution to knowledge or to practice in the candidate's field.

(v) Every thesis shall be written in English Language.

6.18 Format of Spine Title

The title on the cover spine should consist of the degree with the specialization in brackets, followed by the student's initials and surname and year of thesis/dissertation/project defense, as shown in Fig.11.



Fig. 11: Format of the Spine of the Thesis/Dissertation/Project

6.19 General Notes

6. 6.19.1 Typing, margins, line spacing, paging, type and size of paper.

The body of the Thesis/Dissertation/Project should be typed double-spaced on one side of the paper only. The paper should be white, 75-90 gram and A4 sized (210 – 297 mm). The character-set used for typing should preferably be Times New Roman font of size 12pt. Typing should be in black ink. A margin of 2.5 cm should be left all round except on the left margin which should be 3.75 cm wide as shown in Fig.12:

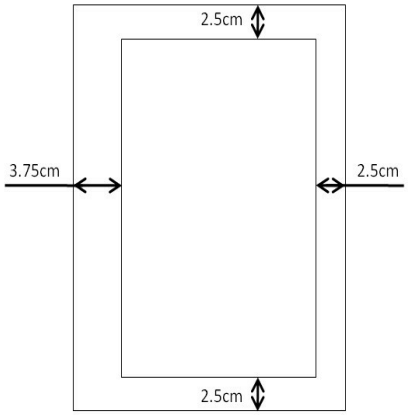


Fig. 12: Sample of Typing, Line Spacing, Paging, Type and Size of Paper

6.19.2 Page Numbering

All pages of the Thesis/Dissertation/Project should carry page numbers centred within the bottom margin of the page. The prefatory pages should be numbered using Roman numerals (I, II.... IX). All pages of the main text of the Thesis/ Dissertation/Project starting with the Introduction (Chapter One) should be consecutively numbered with Arabic numerals (1, 2,..... 250).

Typing of the Thesis/Dissertation/Project should be done using an electronic computer and the printing should preferably be by laser-jet printer.

6.20 Authentication of Thesis/Dissertation/ Project

Each copy of the thesis/dissertation/project has to be authenticated and accepted by the Postgraduate School through the fixation of a Label duly signed and sealed to the reverse side of the cover page. See Figs.13 and 14.

THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE, NIGERIA

...LOGO...

THIS PROJECT SUBMITTED BY

_____

was accepted in Partial Fulfillment of the

Requirements for the Degree of

_____

ofthis University

_____

THE DATE OF AWARD IS

_____

_____ _____

Postgraduate School *Date*

Fig. 13: Sample of Authentication of Project

THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE, NIGERIA

...LOGO...

THIS DISSERTATION/THESIS SUBMITTED BY

_____

was accepted in Partial Fulfillment of the

Requirements for the Degree of

_____

ofthis University

_____

THE DATE OF AWARD IS

_____

_____ _____

Postgraduate School *Date*

Fig. 14: Sample of Authentication of Dissertation/Thesis

SECTION SEVEN
GENERAL REGULATIONS GOVERNING SPECIFIC POSTGRADUATE PROGRAMMES

7.0 Offences and Penalties

7.1 Examination Offences and Penalties

7.1.1 Misconduct before Examination

(i). Misconduct: Involvement in and bearing responsibility for examination question leakage.
Penalty: Expulsion from the University

(ii). Misconduct: Participating in or benefiting from question leakage
Penalty: Expulsion from the University

(iii). Misconduct: Attempting to participate in and/or benefit from examination question leakage.
Penalty: Suspension for two (2) semesters

(iv). Misconduct: Coming into the examination hall within thirty (30) minutes of the commencement of an examination
Penalty: The candidate shall be allowed into the examination hall but he/she shall not be given extra time.

(v). Misconduct: Coming into the examination hall later than thirty (30) minutes after the commencement of an examination.
Penalty: The candidate shall not be allowed into examination hall and he/she shall be scored 0 (F) in the course examined.

7.1.2 Misconduct during Examinations

(i). Misconduct:Sitting for an examination for which a candidate did not register for or qualified to sit for.
Penalty: The result of the candidate in the course shall be nullified. He/She shall be scored 0(F) and be issued a letter of warning.

(ii). Misconduct: Representing/standing in for another candidate in the course of an examination.
Penalty: Expulsion from the University.

(iii). Misconduct: Conniving with another candidate/ student/person to represent/stand in for another candidate in an examination
Penalty: Expulsion from the University.

(iv). Misconduct: Destroying, effacing, mutilating, swallowing of potentially incriminating material relating to a course during the course of an examination.
Penalty: Suspension for two (2) semesters. In addition, the candidate shall be scored 0(F) in the course.

(vi). Misconduct: Displaying of inappropriate or anti-social behaviour (e.g. smoking, singing, cat calls, etc) capable of causing delay and/or disruption of an examination process.
Penalty: Suspension for two (2) semesters

(vii). Misconduct: Displaying of inappropriate or anti-social behaviour leading to disruption and suspension of an examination.
Penalty: Suspension for two (2) semesters

(viii) Misconduct: Giving, or receiving, or in any way benefiting from information relating to a course in an examination through electronic, personal dress material, part of the body in any manner or form whatsoever.
Penalty: Suspension for two (2) semesters

(ix). Misconduct: Leaving the examination hall without the permission of the invigilator
Penalty: Letter of warning. In addition, the candidate shall be scored 0(F) in the course examined.

(x). Misconduct: Leaving the examination hall with examination material before the end of the examination without the permission of the Invigilator
Penalty: Suspension for two (2) semesters.

(xi). Misconduct: Substituting or exchanging the answer script given to a candidate in whatever manner or form, during the examination.
Penalty: Expulsion of all the students involved from the University.

(xii). Misconduct: Exhibiting insulting, rude, impolite behaviour to another student during the course of an examination.
Penalty: Letter of warning

(xiii). Misconduct: Exhibiting insulting, rude, impolite behaviour to a staff during the course of an examination
Penalty: Suspension for two (2) semesters.

(xix). Misconduct: Physical assault on another student during the course of an examination.
Penalty: Suspension for two (2) semesters

(xx). Misconduct: Physical assault or battery on staff during the course of an examination.
Penalty: Expulsion from the University

(xxi). Misconduct: Talking to or communicating with another candidate without due Permission during the course of an examination
Penalty: Letter of warning

(xxii). Misconduct: Bringing in unauthorized materials(s) into the examination hall by a candidate without proven evidence of using the material(s)
Penalty: Suspension for one (1) semester. The candidate shall also be scored 0(F) in the course

(xxiii). Misconduct: Bringing in unauthorized material(s) into the examination hall by a candidate with proven evidence of using the material(s) or any part thereof.
Penalty: Suspension for two (s) semester. The candidate shall also be scored 0(F) in the course.

(xxiv). Misconduct: Failure by a candidate to submit his/ her answer script after taking part in an examination.

Penalty: Suspension for two (2) academic semesters. In addition, the candidate shall be scored 0(F) in the course.

(xxv). Misconduct: Giving/receiving irregular assistance, cheating or aiding and abetting by a candidate/ student in an examination.
Penalty: Suspension for two (2) semesters.

(xxvi). Misconduct: Refusal to sign the Attendance Register during examination
Penalty: Warning

7.1.3 Misconduct after Examination

(i). Misconduct: Involvement in an attempt to substitute or change or remove or effect changes in examination script(s), record sheet(s), attendance register or any examination related material/ document.
Penalty: Expulsion from the University

(ii). Misconduct: Gentle/Subtle exertion of influence with a view to obtaining undue advantage in the grading of scripts or ward of marks on an internal or external examiner.
Penalty: Letter of warning

(iii). Misconduct:Non-gentle/Non-subtle exertion of influence with a view to obtaining undue advantage in the grading of scripts or award of marks by an internal or external examiner.
Penalty: Expulsion from the University

7.2. Misconduct on-Campus

(i). Misconduct: Display of inappropriate or anti-social behaviour (e.g. Smoking, Singing, Cat call, etc) capable of causing delay or disruption of class work, tutorials, lectures, laboratory work etc.
Penalty: Suspension for one (1) semester.

(ii). Misconduct: Display of inappropriate or anti-social behaviour (e.g. Smoking, Singing, Cat call etc) capable of causing delay or disruption leading to suspension of school activities (class work, tutorial, lecture, etc)
Penalty: Suspension for two (2) semesters

(iii). Misconduct: Physical assault or battery on staff in the Departmental or General Offices
Penalty: Expulsion from the University

(iii). Misconduct: Willful damage to any University property or staff and student property.
Penalty: Student shall pay cost of replacement, and be suspended for one (1) semester.

(iv). Misconduct: Non-willful damage to any University property or staff and student property
Penalty: Student shall pay cost of replacement

(v). Misconduct: Physical assault or battery on a member of the community within the University premises.
Penalty: Expulsion from the University

7.3 Behaviour/Misconduct Off-Campus.

(i). Misconduct: Insulting, rude, impolite behaviouron another student outside the University premises
Penalty: Letter of warning

(ii). Misconduct: Physical assault or battery on another student outside the University premises
Penalty: Expulsion from the University

(iii). Misconduct: Exhibiting insulting, rude, impolite behaviour by student or group of Students' on staff outside the University premises
Penalty: Suspension for two (2) semesters

(iv). Misconduct: Physical assault or battery on staff outside the University premises
Penalty: Expulsion from the University.

7.4 Miscellaneous Offences

(i). Misconduct: Obstruction of motorways on-campus or off-campus during or after regular school hours.
Penalty: Letter of warning

(ii). Misconduct: Riotous behaviour on-campus or off-campus, in Bus/Taxi Cabs, Bus stops, in the Hostel or Classroom. Refusal to pay Bus/Taxi fare on campus or off campus.
Penalty: Suspension for one (1) semester.

(iii). Misconduct: Worshipping or holding religious activities in unauthorized, unapproved places, day or night on campus premises.
Penalty: Letter of warning

(iv). Misconduct: Luring/imprisoning falsely a fellow student or a member of staff against his or her wish
Penalty: Expulsion from the University

(v) Misconduct: Indecent assault of a female or male or forceful unsolicited sex of another student.
Penalty: Expulsion from the University

(vi). Misconduct: Sexual harassment of staff by student
Penalty: Expulsion from the University

(vii). Misconduct: Chanting war songs or shouting of slogans by students or group of organized students anywhere on campus or off-campus with an intention to cause disruption to University activities.
Penalty: Suspension for one(1) semester.

(viii). Misconduct: Unsolicited illegal entry of a male student into the female hostel and vice-versa
Penalty: Letter of warning

(ix). Misconduct: Removal of minor personal items and/or articles from public places.
Penalty: Student shall pay cost of replacement of the item or article and be suspended for two (2) semesters.

(x). Misconduct: Fraud, advance fee fraud, embezzlement by any student or group of students.
Penalty: Such student(s) shall be sanctioned as appropriate under the University enabling laws subject to the operating laws in the country.

(xi). Misconduct: Student/candidate who had been issued a letter of warning on account of examination misconduct or other culpable or blameworthy act and was subsequently found culpable of any other blameworthy act or examination misconduct.
Penalty: Suspension for one (1) semester.

(xii). Misconduct: A student/candidate who had been suspended for one semester on account of examination malpractice or other offence and was subsequently found culpable of any other blameworthy act or examination misconduct.
Penalty: Suspension for two (2) semesters.

(xiii). Misconduct: A student/candidate who had been suspended from the University for one session and was subsequently found culpable of any other blameworthy act or examination misconduct
Penalty: Expulsion from the University.

(ix). Misconduct: Staff member accused of involvement in any of the acts of examination misconduct.
Penalty: Referral to the appropriate University Investigation / Disciplinary Committee

7.5 Channel of Communication

In order to ensure that stake holders are appropriately informed on matters pertaining to the day to day administration of Postgraduate matters in the University; the following are the channel of communication for specific stakeholder:

7.5.1 Student

Local: All correspondence emanating from any student must be routed through the student's Supervisor, the Departmental PG Representative, the Head of Department to the Dean, School of Postgraduate Studies or (through the Dean, SPGS to the Vice Chancellor, where applicable). However, the Chairman, SPGAC and the Dean of the Student's School must be copied. The student's phone number and e-mail address must be included in the correspondence.

International: All correspondence emanating from any student in this category must be routed through the student's Supervisor, the Departmental PG Representative, the Head of Department, the Director, International Office to the Dean, School of Postgraduate Studies or (through the Dean, SPGS to the Vice Chancellor, where applicable). However, the Chairman, SPGAC and the Dean of the Student's School must be copied. The student's phone number and e-mail address must be included in the correspondence

7.5.2 Staff

All correspondence emanating from staff must be routed through the Head of Department to the Dean, School of Postgraduate Studies or (through the Dean, SPGS to the Vice Chancellor, where applicable). However, the Chairman, SPGAC, the Department PG Representative and the Dean of the School must be copied. The staff's phone number and e-mail address must be included in the correspondence.

7.5.3 PG Representative /Departmental Coordinator

All correspondence emanating from PG Representative/ Departmental Coordinator must be routed through the Head of Department to the Dean, School of Postgraduate Studies or (through the Dean, SPGS to the Vice Chancellor, where applicable). However, the Chairman, SPGAC and the Dean of the Student's School must be copied. The PG Representative/Departmental Coordinator's number and e-mail address must be included in the correspondence.

7.5.4. Head of Department

All correspondence emanating from the Head of Department must be routed through the Dean of the School (through the Dean, SPGS to the Vice Chancellor, where applicable). However, the Chairman, SPGAC and the PG Representative must be copied. The HOD's phone number and e-mail address must be included in the correspondence.

7.5.5. Chairman, SPGAC

All correspondence emanating from the Chairman, SPGAC must be routed through the Dean of the School (the concerned HOD must be copied) However, the Chairman, SPGAC's phone number and e-mail address must be included in the correspondence.

7.5.6 Communication with Organs of the University

Fig.1 shows the channel of communication among the organs of the university on SPGS matters.

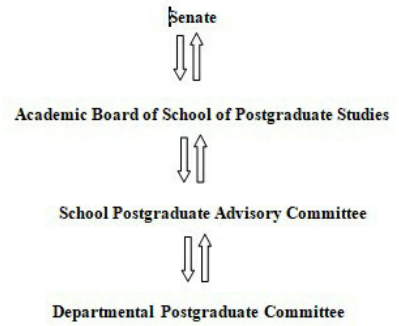


Fig. 1: Flowchart showing communication line within the organs dealing with SPGS

7.6 How to Provide a Feedback on our Services

The School of Postgraduate Studies cherishes feedbacks and also recognizes the right of its major stakeholder (Students) to complain about the quality of service(s) received from any of its officer or office. To this end, any student dissatisfied with the quality of service received from any officer or office with dealings with Postgraduate programmes is encouraged to follow the stated line of complaint in the first instance in order to ensure prompt attention.

When the complaint is against the service(s) received from:

(i) Staff of the SPGS (including Sub-Deans)- the complaint should be directed to the Dean, SPGS.

(ii) Dean of the SPGS- the complaint should be directed to the Vice Chancellor.

(iii) Chairman, SPGAC-the complaint should be directed to the Dean of the School in the first instance, if not satisfied, to the Dean, SPGS.

(iv) Head of Department- the complaint should be directed to the Dean of the School in the first instance, if not satisfied, to the Dean, SPGS.

(v) PG Representative or Postgraduate Diploma Coordinator -the complaint should be directed to the Head of Department, in the first instance, if not satisfied, to the Dean of the School and Dean, SPGS.

The interest of the complainant shall be protected at all times, such that, no form of victimisation or discrimination would be allowed against the complainant. However details of the complaint must be clearly stated in order to ensure that fictitious complain is not made against any of our staff or office

SECTION EIGHT
IMPORTANT SUMMARY: FROM REGISTRATION TO EXAMINATION ROOM

Steps to take for a hitch free Postgraduate Programme (Research Component)

Stage	Remarks	Time Line	Action
Allocation of supervisors	*Recommendation for admission for Masters (Major Supervisor and Co supervisor (s) (as applicable) and Ph.D should be accompanied with the list of supervisors(Major Supervisor and Co supervisors (as applicable) *To be approved by School Postgraduate Advisory Committee (SPAC) *It requires the noting of the Academic Board ***Where there is need to change Supervisors, appropriate form should be completed***	*Masters: To accompany admission list *PhD: To accompany admission list	*Departmental PG Committee *Major Supervisor *Candidate *SPAC *PG Academic Board
Annual Progress Report (APR)on candidate's research (Sessional basis)	*This is to be done on a PG School form *Requires comments and endorsement of the Candidate, The candidate's supervisor; HOD, The Chairman, SPAC, Dean of School *Requires candidate's course work scores where applicable *Approval by the School	***For M.Tech and PGD Students:*** It should be submitted within 2 weeks of the commencement of the Session. Failure to do so within this period attracts a penalty of N20,000 as from the 3rd to 5th week after which the form will no longer be accepted. ***For Ph.D Students:*** It should be submitted latest a month after 1st year of studentship after which N20,000 penalty applies	*Candidate *Supervisor *HOD *Dean of School *SPGS
Renewal of candidate's registration(Annual basis)	*This is to be done online after payment of Tuition Fees by all students. * SPGS to forward list to Departments by 7th week from the beginning of every Session	Two weeks after closure of APRF. A week extension after which payment of N20,000 late registration penalty	*Candidate *SPGS
Pre-Data Seminar	To be presented to the Department	*Masters *PhD	*Supervisors *Department and School *Audience

Stage	Remarks	Time Line	Action
Progress Seminar	To be presented to the Department	*Masters *PhD	*Supervisors *Department/School *Audience
Progress Seminar Final	*A public presentation at Department on the candidate's research project report Requires adequate publicity & invitation of the University Community for Ph.D and M.Tech. *A report (including attendance record) should be forwarded to SPGS	*Masters *PhD A report (including attendance record) is expected to be forwarded to SPGS	*PG Rep, PG Seminar *Coordinator through the HOD *Candidate *Supervisors
Registration of thesis/dissertation title	***Masters***- *The Departmental PG Advisory Committee *SPAC to consider the list and recommend to the SPGS Academic Board for ratification and appointment of external examiner *SPGS Academic Board ratify the list and appointment of external examiner. *However, the list must be accompanied with Clearance form from SPGS for each of the student ***PhD-*** *The Departmental PG Advisory Committee *SPAC to consider the list and recommend to the SPGS Academic Board for approval and Senate's ratification. *However, the list must be accompanied with Clearance form from SPGS for each of the student	***Masters-*** Minimum of 14 months after commencement of programme ***PhD-*** Minimum of 30 months for Full Time and 42 months for Part Time after commencement of programme	*Candidate & Major Supervisor is to ensure compliance. *Action is by Supervisors *Departmental PAC Committee *SPAC *SPGS
Supervisors' report of satisfactory progress on research work for M.Tech & Ph.D	*Supervisors' report of satisfactory progress on research work must be submitted to SPAC with copy forwarded to SPGS for M.Tech & Ph.D *A short report on candidate's research report; endorsed by ALL members of the supervision team every 6 months	Each SPAC is expected to present report on candidate's research report every 6 months	Major Supervisor Guided by PG Representative/ HOD

Stage	Remarks	Time Line	Action
Nomination of external examiner	*A suitable external examiner (an expert in the student's research area) is officially nominated and recommended to Senate through the SPGS Academic Board. *Fresh recommendation is to be accompanied by a copy of the suggested external examiner's abridged version of the CV	To accompany Thesis Title Registration Recommendation to the Academic Board	The major supervisor through the Head of Department.
Submission of soft copies of thesis/dissertation /report	*Preparation of soft copies of the thesis/dissertation/report should STRICTLY COMPLY with the RECOMMENDED guidelines for preparation of thesis as provided by. When available, the SPGS shall subject the submission to Quality assurance test, for plagiarism, Compliance in this regard will save time, money and unnecessary wastages. * Submission of hardcopy – for Examination -1st week of submission to SPGS: Thesis/Dissertation forwarded to all examiners with the appropriate examination form -Oral examination not later than 2 months upon submission		Thesis prepared without compliance will not be accepted by SPGS Allow adequate time for Processing *For action:* *Supervisor *HOD *Dean of School
Arrangement for oral examination	*The conduct of oral examination is the responsibility of the SPGS School. The input of the candidate's department is important particularly in the provision of necessary information that will assist the School. *All examiners are to ensure that duly signed preliminary reports (using the recommended format) on the candidate's thesis/dissertation get to the School on time. *Fixing a date for oral examination depends on the receipt of positive external examiner's report, suitability of suggested date within stipulated period in addition to the fulfillment of other administrative conditions *The external Examiner in conjuction with the department should ensure that in addition to sending the copy (hard or scanned) of the preliminary thesis assessment form to the Dean, School of Postgraduate Studies, 2 weeks in advance for Masters oral examinations and 3 weeks in advance for Ph.D oral examinations; is also expected to send a copy of the same form to the Head of Department (Chief Examiner) of the candidate whose thesis is expected to be examined. * It is expected that the Chief Examiner, after receiving the said form, will write a letter informing the school of Postgraduate Studies of the date of arrival of the External Examiner for the candidate's oral examination, thus initiating the process of arrangement for the examination. *Properly completed thesis examination reports (hard and electronic copies) are to be duly endorsed by the examination panel		*PG School confirms date for oral examination. *Examination panel members *External/Examiner/ SPGS *The HOD

Stage	Remarks	Time Line	Action
Submission of Corrected/Bound version of thesis / dissertation/report and approval of results	*This depends on response from the candidate and endorsement by the Major Supervisor *Major Supervisor is to ensure that ALL suggested corrections and amendments are effected and checked before re-submission. *Properly completed Certificate of correction of thesis/dissertation is to be duly endorsed by the supervisor, the HOD and the Chairman, SPAC before it is forwarded to the PG School. *After clearance by the Supervisor, the Certificate of correction must not spend more than **24hrs on the table of the HOD** and the Chairman, SPAC before it is forwarded to the PG School. *Final bound copies of the thesis/dissertation in the recommended format are to be endorsed as appropriate. **Recommendation (A): "Thesis/Dissertation is approved without corrections"** **Time Frame/Penalty:** A student for which this recommendation is returned shall be expected to submit the bound and electronic version of the thesis/dissertation within four (4) weeks after the date of the examination, failing which the candidate shall pay a penalty fee as specified at time to time. **Recommendation (B): "Thesis/Dissertation approved subject to verification by Chief Examiner of corrections pointed out during the examination."** **Time Frame/Penalty:** A candidate for whom this recommendation is returned shall be expected to submit the corrected bound version and electronic copy of the thesis/dissertation within six (6) weeks after the date of the examination. However, if this submission should extend beyond six (6) weeks, he/she shall pay a penalty fee as specified from time to time. **Recommendation (C): "Thesis/Dissertation approved subject to verification by External Examiner of corrections pointed out during the examination."** **Time Frame/Penalty:** A candidate for whom this recommendation is returned shall be expected to submit the corrected bound version and electronic copy of the thesis/dissertation to the Department within three (3) months after the date of the examination. The Department shall submit same to the External Examiner for final verification immediately and in any case not later than four (4) weeks from the date student submit to the Department. In case a student fails to meet the six months ultimatum, he/she shall pay a penalty fee as specified from time to time		*Candidate *Candidate Supervisor *HOD *Dean of School ***Allow 1-2 months for processing before requesting for statement of result***

Stage	Remarks	Time Line	Action
	Recommendation (D): "Thesis/Dissertation not approved and student should do additional work and/or re-write and be re-examined." **Time Frame/Penalty:** A candidate for whom this recommendation is returned shall be expected to re-write, be re-examined and submit his/her corrected bound version and electronic copy of the thesis/dissertation within 12 months and pay additional school fees for the sessions into which his/her studentship is extended. **Validity** A student who fails to submit the bound version and electronic copy of the thesis/dissertation at the expiration of the time stipulated above (Recommendations A - D) with genuine reasons already communicated to the SPGS will be given an additional period equivalent to the period earlier given subject to the payment of another fine as specified from time to time after which the examination becomes invalid. A student who fails to submit after the second chance shall automatically forfeit his/her studentship.		

NOTES

- On no account should students handle official documents and are discouraged from having direct contact with the HOD on examination related matters. Rather, they should process ALL requests through their supervisors, Departmental Postgraduate Representative/Postgraduate Diploma Coordinator and Head of Department (see section 7.5 for appropriate channel of communications)
- It is important that the office of the HOD keeps good records of movement of official documents.
- All matters involving substitution of supervisors due to various reasons should be properly resolved before the conduct of oral examination.
- As much as possible, copies of correspondence in respect of each candidate are required to be kept in the candidate's departmental file as a back-up copy.
- Time and money have been wasted in the desire to get things done quickly particularly towards the end of the session. Candidates and supervisors will be responsible for delays arising from not doing things right. It is therefore important that we plan our time and also be conscious of the duties and responsibilities of all concerned.
- At every stage the need to be THOROUGH is VERY ESSENTIAL.
- Every effort should be geared towards preserving the integrity of the degree in view.

SECTION NINE
DEPARTMENTAL PROGRAMMES

9.1 SCHOOL OF AGRICULTURE AND AGRICULTURAL TECHNOLOGY (SAAT)

9.1.1 DEPARTMENT OF AGRICULTURAL EXTENSION AND COMMUNICATION TECHNOLOGY (AEC)

PROGRAMMES OFFERED:

A. M. Agric Tech with specialization in:
   - i General Extension
   - ii Agricultural Communication iii Technology Transfer
   - iv Rural Development

B. Ph.D with specialization in:
   - i General Extension
   - ii Agricultural Communication iii Technology Transfer
   - iv Rural Development

PHILOSOPHY AND OBJECTIVES

The objectives of post graduate programme in the department are to train professional agricultural extensions officers, rural sociologist and social development worker who will serve in both private and public sectors of the economy.

The philosophy of the programme is to provide functional education for post-graduate student who eventually after the training will become job maker and job creator, who in addition will be trainer of top level academic and master of industrial sector.

ADMISSION REQUIREMENTS

A.Master of Agricultural Technology (M. Agric. Tech.)

i. Candidates with first degree in Agriculture and related discipline with a minimum of Second Class lower Division.

B Doctor of Philosophy (Ph.D)

Candidates with M. Tech/M. Agric Tech/M.Sc. in Food Science and Technology and related disciplines from other recognised institutions with a CGPA of not less than 3.50 or 60% in the overall result. Where applicable, the candidate may be required to score not less than 60% in the overall thesis examination.

DURATION OF THE PROGRAMME

A Master of Agricultural Technology (M. Agric Tech)

Full time: 18-24 months

B Doctor of Philosophy (Ph.D)

Full time: 36-48 months

Part time: 48-72 months

REQUIREMENTS FOR GRADUATION

A Master of Agricultural Technology Programme (M. Agric. Tech.)

i. Accumulated TLU of 45 including 12 units of Research Project, 33 units of 11 compulsory or core courses.

ii. Successfully presented 3 Departmental Research Project Seminars.

iii. Successfully defended the Research Project in the specialist area at an oral examination organized by the School of post-graduate studies.

B Doctor of philosophy Ph.D PROGRAMME

A candidate is awarded a Ph.D degree after he has successfully:

i. Completed any prescribed course work.

ii. Presented 3 Departmental Research Project Seminars,

iii. Defended the research thesis in a specialist area at an oral examination organized by the school of post-graduate studies.

COURSE OUTLINE (AGRICULTURAL EXTENSION AND COMMUNICATION TECHNOLOGY OPTION)

1ST SEMESTER

COURSE CODE	COURSE TITLE	L	T	P	U
AEC 801	Research Methodology	3	0	0	3
AEC 825	Program Planning and Evaluation	3	0	0	3
AEC 827	Extension Administration	3	0	0	3
AEC 829	Advanced Rural Sociology	3	0	0	3
AEC 831	Advanced Psychology for Extension Personnel	3	0	0	3
	Total				15

2ND SEMESTER

COURSE CODE	COURSE TITLE	L	T	P	U
AEC 826	Statistical Theory & Analysis	3	0	0	3
AEC 828	Participatory & Rural development Approach	3	0	0	3
AEC 830	Measurement & Scaling Technique in extension	3	0	0	3
AEC 832	Extension Teaching and Communication	3	0	0	3
AEC 834	Advanced Social Work	3	0	0	3
AEC 836	Seminar	3	0	0	3
	Total				18

3RD SEMESTER

COURSE CODE	COURSE TITLE	L	T		P	U
AEC 899	Master's Thesis Research Project					12

AEC 801 RESEARCH METHODOLOGY 3 UNITS

Steps in the research process and their application; science and scientific methods; delineation of research problems and development of research objectives, research designs in social research, data gathering with emphasis on field surveys, analyzing data and reporting results. Students are expected to demonstrate their understanding of research methodology by preparing a research proposal dealing with economic problems.

AEC 825 PROGRAM PLANNING AND EVALUATION 3 UNITS

Principle and concepts of Program Planning in Extension; Basic Steps in Program Development; Determination of needs, Clarification of Problems, Setting of Objectives. Development of a plan, Obtaining Staff and Clientele commitment to action, Program implementation and appraisal.

AEC 826 STATISTICAL THEORY AND ANALYSIS 3 UNITS

Descriptive statistics; Mean, Median, Mode, Histogram, Bar Chart, Pie Chart, Inferential statistics; Chi square, Analysis of Variance, t-test, Correlation, Regression. Measurement of Variables.

AEC 827 EXTENSION ADMINISTRATION 3 UNITS

Theory and Practice of Administration Organisational Structure as applied to Agric. Extension Services in Nigeria, Personnel Management, Fiscal Control, Assessment of Extension work accomplishment.

AEC 828 PARTICIPATORY AND RURAL DEVELOPMENT APPROACHES 3 UNITS

Identification of needs, Past and Present Rural development Strategies Dimensions of Rural Extension- Research Linkages (Terminology transfer) Participatory Approach in Rural Development Extension Models.

AEC 829 ADVANCED RURAL SOCIOLOGY 3 UNITS

General Sociology, Theory Analysis of Social System, Relation of Individual to his Social environment, Group Dynamics, Leadership Patterns, Social Change and Community Organisation.

Special Topics in Rural Sociology.

AEC 830 MEASUREMENT AND SCALING TECHNIQUE IN EXTENSION 3 UNITS

Meaning and scales of Measurement, Factors influencing the choice of appropriate parametric tests, Principles of Test Construction- statistical concepts, Item Analysis. Types and Measurement of Reliability and validity. Techniques for attitude scale construction, method of paired comparison. Equal-appearing intervals, successive intervals, summated ratings scalogram analysis.

AEC 831 ADVANCED PSYCHOLOGY FOR EXTENSION PERSONNEL 3 UNITS

Concepts of Human Development; Intelligence; Individual Differences; Teaching learning Process; Motivation to extension Education.

AEC 832 EXTENSION TEACHING AND COMMUNICATION 3 UNITS

Setting up effective learning situation in Rural Areas; Motivation principles in adult learning communication and diffusion process; Practice of selective Extension methods including Demonstrations, meetings, tours, exhibits and audio visual aids.

AEC 834 ADVANCED SOCIAL WORK 3 UNITS

Concept of Social Work strategies for Communal Mobilization for Developmental Projects. Social Work Techniques and Appraisal; Methods social Work Designs; Social Work in Health. Nutrition Environmental Management Education etc. Evaluation in Social Work.

AEC 836 SEMINAR 3 UNITS

Seminar Topics in Areas of Agricultural Extension and Communication. Each candidate is expected to make two seminar presentations.

AEC 899 MASTER'S THESIS RESEARCH PROJECT 12 UNITS

An original investigation in a title approved by the school of Post Graduate Studies. A thesis must be completed with significant contribution to knowledge. The thesis shall be defended in an open and oral examination organized by the School of Postgraduate Studies.

AEC 999 Ph.D RESEARCH PROJECT

An original investigation in a title approved by the school of Post Graduate Studies. A thesis must be completed with significant contribution to knowledge. The thesis shall be defended in an open and oral examination organized by the School of Postgraduate Studies.

LIST OF ACADEMIC STAFF (AEC)

S/N	Name	Status	Area of Specialization
1	OKUNLOLA James Olaniyi	Professor	Agricultural Extension & Rural Development
2	ALFRED Simon Dada Yomi	Professor	Rural Psychological Studies & Health
3	FASINA Oluwatosin Oluwasegun	Professor	Agricultural Extension & Rural Development
4	AKINNAGBE Oluwole Matthew	Professor	Agricultural Planning & Evaluation
5	ODEFADEHAN Olalekan Olamigoke	Reader	Rural Sociology
6	AKINWALERE Bosede Omoabugan	Reader	Environmental Extension & Management
7	AYODELE Omowumi Veronica	Senior Lecturer	Agricultural Extension & Rural Development
8	WOLE-ALO Felicia Itunnu	Senior Lecturer	Agricultural Extension & Rural Development

9.1.2 DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

1. PROGRAMMES OFFERED:

(a) Master of Technology (M. Agric. Tech)
(b) Doctor of Philosophy (PhD).

2. AVAILABLE OPTIONS/SPECIALIZATION

(a) M. Agric. Tech. with specialization in:
(i) Agricultural Production Economics.
(ii) Agricultural Marketing.
(iii) Agricultural Policy
(iv) Agricultural Finance
(v) Environmental Economics

(b) PhD with specialization in:
(i) Agricultural Production Economics.
(ii) Agricultural Marketing.
(iii) Agricultural Policy
(iv) Agricultural Finance
(v) Environmental Economics

3. PHILOSOPHY AND OBJECTIVES

The objectives of postgraduate programmes in the Department are to train professional agricultural economists and social development worker who will serve in both private and public sectors of the economy.

The philosophy of the programme is to provide functional education for post-graduate students who eventually after the training will become job creators who in addition will be trainers of top level academic and masters of industrial sector.

4. ADMISSION REQUIREMENTS

(a) Master of Agricultural Technology (M. Agric. Tech)

(i) Candidates must posses 5 Credits at WASCE or SSCE or NECO or GCE at a maximum of two sittings with credit in English Language, Chemistry, Biology or Agricultural Science, Mathematics or Statistics and any one of Economics, Geography or Physics.
(ii) Candidates with PGD (upper credit or Distinction)
(iii) Candidates with first degree in Agriculture and related disciplines with a minimum of Second Class Lower Division subject to available space.

(b) Doctor of Philosophy (Ph.D)

Candidates with M. Tech/ M. Agric. Tech./ M.Sc. In Agricultural Economics and related disciplines from other recognized Institutions with a CGPA of not less than 3.50 or 60% in the overall result. Where applicable, the candidate may be required to score not less than 60% in the oral thesis examination.

5. DURATION OF THE PROGRAMME

(a) Master of Agricultural Technology (M. Agric. Tech)

Full time: 18 – 24 months
Part time: 24 – 36 months

(b) Doctor of Philosophy (Ph.D)

Full time: 36 - 48 months
Part time:48 – 72 months

(In both cases Senate may extend the duration as it deems fit and necessary).

6. REQUIREMENTS FOR GRADUATION

(a) Master of Agricultural Technology Programme (M. Agric. Tech)

(i) Accumulated TLU of 36 including 12 units of Research Project, 18units of 6 compulsory or core and 6 units of Elective courses,
(ii) Successfully presented 3 Departmental Research Project Seminars,
(iii) Successfully defended the Research Project in the specialist area at an oral examination organized by the School of Postgraduate studies.

(b) Doctor of Philosophy Ph.D PROGRAMME

A candidate is awarded a Ph.D degree after he has successfully:
(i) Completed any prescribed course work;
(ii) Presented 3 Departmental Research Project Seminars;
(iii) Defended the Research thesis in a specialist area at an oral examination organized by the School of Postgraduate Studies.

7. COURSE OUTLINE

(a) **M. TECH**

1ST SEMESTER

Course Code	Course Title	L	T	P	Units
ARE 801	Research Methodology	2	1	0	3
ARE 803	Advanced Microeconomic Theory	2	1	0	3
ARE 805	Statistical Theory & Analysis	2	1	0	3
ARE 807	Operations Research	2	0	0	2
ELECTIVES					4
TOTAL					15

ELECTIVES

Course Code	Course Title	L	T	P	Units
ARE 809	Agricultural Marketing	2	0	0	2
ARE 811	Agricultural Planning & Appraisal	2	0	0	2
ARE 813	Agribusiness Management	2	0	0	2

OTHERS (FOR Ph. D STUDENTS)*

Course Code	Course Title	L	T	P	Units
ARE 815	Advanced Econometric Analysis Mathematical Programming Techniques	2	0	0	2
ARE 817	Advanced Resource Economic	2	0	0	2
ARE 819	Advanced Agribusiness Management	2	0	0	2
ARE 821	Agricultural Planning & Policy	2	0	0	2
ARE 823	Farm Decision Theory	2	0	0	2

2ND SEMESTER

Course Code	Course Title	L	T	P	Units
ARE 802	Advanced Production Economics	2	1	0	3
ARE 804	Advanced Macroeconomic Theory	2	1	0	3
ARE 806	Natural Resource Economics	2	0	0	2
ARE 808	Econometrics	3	0	0	3
ARE 810	Seminar	0	2	0	2
ELECTIVES					2
TOTAL					15

ELECTIVES **15**

Course Code	Course Title	L	T	P	Units
ARE 812	Agricultural Finance	2	0	0	2
ARE 814	Agricultural Policy and Analysis	2	0	0	2
ARE 816	Agricultural Cooperatives	2	0	0	2
ARE 899	Thesis Research Project				12

OTHERS (FOR Ph.D STUDENTS)*

Course Code	Course Title	L	T	P	Units
ARE 818	Seminar in Production Economics and Farm Management	2	0	0	2
ARE 820	Seminar in Quantitative Techniques	2	0	0	2
ARE 822	Seminar in Resource Economics	2	0	0	2
ARE 824	Seminar in Marketing/Cooperative business Management	2	0	0	2

*Ph.D students are required to offer 6 units of M. Tech. Course work relevant to their area of specialization.

COURSE SYNOPSES

(A) M. TECH

ARE 801 Research Methodology – 3 Units

Steps in the research process and their application; science and the scientific methods; delineation of research problems and development of research objectives, research designs in social research, data gathering with emphasis on field surveys, analyzing data and reporting results. Students are expected to demonstrate their understanding of research methodology by preparing a research proposal dealing with an economic problems.

ARE 02 Statistical Theory and Analysis – 3 Units

Probability functions and probability laws; expectation of functions, random variables – independent and joint distribution and their expectation, central limit theory; analysis of variance, multiple comparisons, economic application of stochastic processes; markov chains.

ARE803 Advanced Microeconomic Theory – 3 Units

Individual Decision Making – Preference and Choice, Consumer Choice, Classical Demand Theory, Aggregate Demand, Production, Choice Under Uncertainty; Game Theory – Basic Elements of Non-cooperative games, simultaneous-move games, dynamic Games; Market

Equilibrium and Market Failure – Competitive Markets, Externalities and Public Goods, Market Power, Adverse Selection, Signaling and Screening, The Principal-Agent Problem; General Equilibrium – General Equilibrium Theory: Some Examples, Equilibrium and its Basic Welfare Properties, The Positive Theory of Equilibrium, General Equilibrium under Uncertainty, Equilibrium and Time; Welfare Economics and Incentives – Social Choice Theory, Elements of Welfare Economics and Axiomatic Bargaining, Incentives and Mechanism Design.

ARE 804 Advanced Macroeconomic Theory – 3 Units
The mechanics of national income determination, consumption demand, the demand for money, investment demand, classical price determination, Keynesian employment level determination; monetarist growth theories and theories of technical progress; the macro-theory of distribution and disaggregated general equilibrium system and welfare theory.

ARE 805 Advanced Production Economics – 3 Units
Development and application of neoclassical theory of production and within the agricultural industry; theories of production, agricultural production functions, resource and returns to production in agricultural, agricultural cost and supply function, optimization of productions and farm equilibrium, farm planning and linear programming, farm planning under uncertainty.

ARE 806 Natural Resource Economics – 2 Units
Renewable and non-renewable resources; institutional consideration in resource economics, theoretical bases for rationality in agricultural resource allocation.

ARE 807 Operations Research – 2 Units
Techniques of quantitative tools in applied research, inventory models, product storage queuing theory, replacement models, allocative models, linear programming, transportation and assignment models, dynamic models; input-output analysis.

ARE 808 Econometrics – 3 Units
Models and model building; concepts of statistical inference, simple linear regression models, multiple linear progression model; violation of basic assumptions of regression and correlation, single equation problem. Formulation and estimation of special models, models with restricted coefficients, distributed lag models, models with binary variables, non linear models; simultaneous equation models.

ARE 809 Agricultural Marketing – 2 Units
Theories of marketing, concepts and models of marketing functions, processing and transportation models, etc. marketing institutions; market structure, conduct and performance, prices, margins, economies of scale, consumer economics and demand analysis.

ARE 810 Seminar – 2 Units
Seminar topics in areas of Agricultural and Resource Economics. Each candidate is expected to make two seminar presentations.

ARE 811 Agricultural Planning and Appraisal – 2 units
Meaning of projects appraisal, relationship between appraisal and planning, the distinction between financial and economic appraisal; tools of project analysis, the arithmetic of project appraisal; issues in the appraisal of agricultural projects, agricultural plan implementation.

ARE 812 Agricultural Finance – 2 Units
Review of capital and investment theory analysis of short-term working capital needs, cash budgeting procedures, treatment of uncertainty in investment decisions; proforma statements, types of short-term loan arrangements, short-term asset management, emphasis on relevant examples in Nigeria.

ARE 814 Agricultural Policy Analysis – 2 Units
Theory of economic development, policies for economic development and characteristics of economically less developed countries and areas; analytical treatment of governmental policies and programmes affecting Nigerian agriculture, evaluation of agricultural policy in a developing economy; comparative agricultural development; individual country studies and seminars.

ARE 816 Agricultural Cooperatives – 2 Units
Meaning, Definition & Scopes of Cooperative, Principles of Cooperative, Reasons for Establishing Cooperative, Features of Cooperative, Structure of Cooperative, Legal aspect of Cooperative, Democratic Control & Policy of Cooperatives, Cooperative Education, Types of Cooperatives, Cooperative Financing, Agricultural Cooperative, Classes & Categories of Agricultural Cooperative.

ARE 899 Master's Thesis Research Project – 12 Units
An original investigation in a title approved by the School of Postgraduate Studies. A thesis must be completed with significant contribution to knowledge. The thesis shall be defended in an open and oral examination organized by the School of Postgraduate Studies.

C. Ph. D

ARE 999 Ph.D Research Project
An original investigation in a title approved by the School of Postgraduate Studies. A thesis must be completed with significant contribution to knowledge. The thesis shall be defended in an open and oral examination organized by the School of Postgraduate Studies.

ACADEMIC STAFF LIST

S/N	Names	Qualifications	Status	Specialization
1.	Dr. (Mrs.). S. F. Arifalo	B. Agric. Tech., M. Agric. Tech., Ph.D (Akure)	Reader	Resource & Environmental Economics
2.	Prof. A. I. Ajibefun	B. Agric. Tech. (Akure), M.Sc. (Ibadan), Ph.D (Akure)	Professor	Production Economics & Environmental. Economics
3.	Prof. T. T. Amos	B.Sc.(Ibadan) M.Sc., Ph.D (Zaria)	Professor	Production Economics
4.	Prof. S. O. Ojo	B.Sc. (Ife), M.Sc. (Ibadan), Ph.D (Akure)	Professor	Production Economics
5	Prof. A. E. Oguntade	B.Sc., M. Phil. (Ife), Ph.D (Giessen)	Professor	Farm Management/Production Economics
6.	Prof. J. A. Afolabi.	B.Sc. M.Sc., (Ibadan) Ph.D (Akure)	Professor	Agricultural Finance & Agricultural Marketing
	Prof. T. E. Mafimisebi	B.Sc. M.Sc., Ph.D (Ibadan)	Professor	Agricultural Marketing & Agribusiness Management
7.	Prof. J. O. Oseni	B.Sc., M.Sc., (Ilorin), Ph.D (Akure)	Professor	Agricultural Marketing
8.	Prof. O. O. Akinrinola	B.Sc. (Ife), M.Sc. (Ibadan), Ph.D (Akure)	Professor	Agricultural Finance
9.	Dr. O. A. Thompson	B.Sc. (Benin), M. Agric. Tech., Ph.D (Akure)	Reader	Resource and Environmental Economics
10	Dr. D. O. Awolala	B. Agric. Tech., M. Agric. Tech. (Akure) Ph.D (Dakar)	Reader	Environmental Economics, Production Economics & Adaptation Finance
11	Dr. I. O. Ogunwande	B.Sc. M.Sc. (Ibadan), Ph.D (Akure)	Senior Lecturer	Production & Welfare Economics
12	Dr. L. O. Oparinde	B. Tech. (Ogbomoso), M. Agric. Tech., Ph.D (Akure)	Senior Lecturer	Production and Environmental Economics
13	Dr. W. M. Ashagidigbi	B.Sc., M.Sc., Ph.D (Ibadan)	Senior Lecturer	Welfare Economics
14	Dr. (Mrs.) A. A. Obisesan	B. Agric. (Ife), M.Sc., Ph.D (Ibadan)	Senior Lecturer	Development Economics & Agribusiness
15	Dr (Mrs) O. Oduntan	B. Agric. Tech., M. Agric. Tech., Ph.D (Akure)	Senior Lecturer	Production Economics
16	Dr (Mrs) S. Adewole	B. Agric. Tech., M. Agric. Tech., Ph.D (Akure)	Senior Lecturer	Agricultural Marketing

9.1.3 DEPARTMENT OF ANIMAL PRODUCTION & HEALTH (APH)
ANIMAL REPRODUCTION AND PHYSIOLOGY OPTION

A	CORE COURSES:	UNITS
i.	Biostatistics and Experimental Design	3
ii.	Research Techniques in Animal Production and Health	3
iii.	Computer Applications in Animal Production and Health	3
iv.	Advanced Monogastric Animal Management	2
v.	Advanced Ruminant Animal Management	2
	Sub-total	**13**

B	REQUIRED COURSES	UNITS
i.	Advanced Reproductive Physiology	3
ii.	Advanced Endocrinology	3
iii.	Environmental Physiology	3
iv.	Reproductive and Controlled Breeding	3
v.	Physiology of Lactation	2
vi.	Artificial Insemination	3
vii.	Animal Biotechnology	2
viii.	Comparative Embryology of Farm Animals	3
ix.	Student's Seminar	2
x.	Dissertation	12
	Sub-total	**36 units**

C	ELECTIVES	UNITS
i	Advanced Ethology	2
ii	Molecular and Biochemical Genetics	3
iii	Immunogenetics	2
iv	Digestive Physiology	2
v	Physiology of Growth	3
vi	Nutritional Toxicology	2
	Sub-total	**14 Units**

D SUMMARY

1st Semester	20 units
2nd Semester	16 units
3rd& 4th Semester	12 units
Total	**51 units**

FIRST SEMESTER

Course Code	Course Title	Units
APH 801	Biostatistics and Experimental Design	3
APH 803	Computer Application in Animal Production	3
APH 855	Advanced Monogastric Management	2
APH 813	Advanced Reproductive Physiology	3
APH 819	Environmental Physiology	3
APH 821	Physiology of Lactation	2
APH 817	Animal Biotechnology	2
APH 811	Animal breeding and genetics	3
	TOTAL	**21**

SECOND SEMESTER

Course Code	Course Title	Units
APH 802	Research Techniques in Animal Production	3
APH 806	Advanced Ruminant Management	2
APH 824	Advanced Endocrinology	3
APH 826	Reproductive Management & Controlled Breeding	3
APH 828	Artificial Insemination	3
APH 858	Comparative Embryology of Farm Animals	3
APH 800	Students' Seminar	2
	TOTAL	**19**

THIRD & FOURTH SEMESTER

Course Code	Course Title	Units
APH 899	Dissertation	12
	TOTAL	**12**

AGRICULTURAL BIOCHEMISTRY AND NUTRITION OPTION

A	CORE COURSES	UNITS
i.	Biostatistics and Experimental Design	3
ii.	Research Techniques in Animal Production and Health	3
iii.	Computer Applications in Animal Production and Health	3
iv.	Advanced Monogastric Animal Management	2
v.	Advanced Ruminant Animal Management	2
	Sub-total	**13**

B	REQUIRED COURSES	UNITS
i.	Advanced Biochemistry	3
ii.	Advanced Animal Nutrition	2
iii.	Bioenergetics	3
iv.	Laboratory Techniques and Instrumentation	3
v.	Advanced Animal Products and by-Products Technology	3
vi.	Feeds, Feed Production and Feed-mill Management	3
vii.	Advanced Ruminant Animal Management	2
viii.	Metabolism of Minerals and Vitamins	3
ix	Metabolism of Proteins and Nucleic acids	2
x.	Student's Seminar	2
xi.	Dissertation	12
	Sub-total	**38**

C	ELECTIVES	UNITS
i	Nutritional Toxicology	2
ii	Animal Health and Disease control	3
iii	Advanced Pasture and Range Management	3
iv	Forage Resources and Utilization	3
vi.	Dissertation	12
	Sub-total	**23**

FIRST SEMESTER

Course Code	Course Title	Units
APH 801	Biostatistics and Experimental Design	3
APH 803	Computer Application in Animal Production and Health	3
APH 855	Advanced Monogastric Management	2
APH 825	Advanced Biochemistry	3
APH 805	Advanced Animal Nutrition	2
APH 809	Laboratory Techniques and Instrumentation	3
APH 851	Bioenergetics	3
APH 829	Nutritional Toxicology	2
	TOTAL	**21**

Electives

Course Code	Course Title	Units
APH 808	Animal Health and Disease Control	3
APH 817	Animal Biotechnology	2
	TOTAL	**5**

SECOND SEMESTER

Course Code	Course Title	Units
APH 806	Advanced Ruminant Animal Management	2
APH 814	Feeds, Feed Production and Feed- mill Management	3
APH 820	Metabolism of Minerals and Vitamins	3
APH 822	Metabolism of Proteins and Nucleic acids	2
APH 844	Advanced Animal Products and by products Technology	3
To be renamed	Advanced Pasture and Range Management	3
APH 800	Students' Seminar	2
	TOTAL	**18**

Electives

Course Code	Course Title	Units
APH 818	Forage Resources and Utilization	3
	TOTAL	**3**

THIRD & FOURTH SEMESTER

Course Code	Course Title	Units
APH 899	Dissertation	12
	TOTAL	**12**

D SUMMARY:

1st Semester	21units
2nd Semester	18units
3rd&4th Semesters	12units
Total	**51 units**

ANIMAL BREEEDING AND GENETICS OPTION

A.	CORE COURSES	UNITS
i.	Biostatistics and Experimentation Design	3
ii.	Computer Application in Animal Production & Health	3
iii.	Advanced Monogastric Animal Management	2
iv.	Advanced Ruminant Animal Management	2
v.	Research Techniques in Animal Production	3
	Sub-total	**13**

B.	REQUIRED COURSES	UNITS
i.	Advanced Animal Breeding and Genetics	3
ii.	Molecular and Biochemical Genetics	3
iii.	Research Techniques in Animal Production & Health	3
iv.	Quantitative Genetics	3
v.	Advanced Reproductive Physiology	3
vi.	Introduction to Population Genetics	3
vii.	Immunogenetics	3
viii.	Animal Biotechology	2
ix.	Students' seminar	2
x.	Dissertation	12
	Sub-total	**37**

C.	ELECTIVES	UNITS
i.	Reproductive Management and Controlled Breeding	3
ii.	Livestock Farming Systems	3
iii.	Advanced Ethology	2
	Sub-total	**8**

FIRST SEMESTER

Course Code	Course Title	Units
APH 801	Biostatistics and Experimental Design	3
APH 803	Computer Application in Animal Production & Health	3
APH 855	Advanced Monogastric Management	2
APH 809	Laboratory Techniques and Instrumentation	3
APH 811	Advanced Animal Breeding and Genetics	3
APH 833	Molecular and Biochemical Genetics	3
APH 813	Advanced Reproductive Physiology	3
APH 817	Animal Biotechnology	2
	TOTAL	**22**

Electives

Course Code	Course Title	Units
APH 844	Advanced Animal Products and by products Technology	3
	TOTAL	**3**

SECOND SEMESTER

Course Code	Course Title	Units
APH 802	Research Techniques in Animal Production and Health	3
APH 830	Quantitave Genetics	3
APH 806	Advanced Ruminant Animal Management	2
APH 846	Population Genetics	2
APH 836	Immunogenetics	3
APH 860	Bioinformatics	2
APH 800	Students' Seminar	2
	TOTAL	**17**

Electives

Course Code	Course Title	Units
APH 810	Advanced Ethology	2
APH 826	Reproductive Management and Controlled Breeding	3
APH 816	Livestock Farming	3
	TOTAL	**8**

THIRD & FOURTH SEMESTER

Course Code	Course Title	Units
APH 899	Dissertation	12
	TOTAL	**12**

D SUMMARY

1st Semester	22units
2nd Semester	17units
3rd&4th Semesters	12units
Total	**51 units**

M.AGRIC. TECH. ANIMAL PRODUCTION AND MANAGEMENT OPTION

A. CORE COURSES **UNITS**

i. Biostatistics and Experimentation Design 3
ii. Computer Application in Animal Production and Health 3
iii. Advanced Monogastric Animal Management 2
iv. Advanced Ruminant Animal Management 2
v. Research Techniques in Animal Production and Health 3 **Sub-total 13units**

B. REQUIRED COURSES

i. Advanced Animal breeding and Genetics 2
ii. Advanced Animal Nutrition 2
iii. Laboratory Techniques and Instrumentation 3
iv. Advanced Reproductive Physiology 3
v. Advanced Ruminant Animal Management 2
vi. Advanced Animal Products and by-product Technology 3
vii. Animal Health and Disease Control 3
viii. Advanced Ethology 3
ix. Students' Seminar 2
x. Laboratory Techniques and Instrumentation 3
xi. Livestock Farming Systems 3
xii. Dissertation 1 2
Sub-total 41units

FIRST SEMESTER

Course Code	Course Title	Units
APH 801	Biostatistics and Experimental Design	3
APH 803	Computer Application in Animal Production	3
APH 855	Advanced Monogastric Management	2
APH 811	Advanced Animal breeding and Genetics	2

APH 805	Advanced Animal Nutrition	2
APH 809	Laboratory Techniques and Instrumentation	3
APH 813	Advanced Reproductive Physiology	3
APH 839	Advanced Pasture &Range Management	3
	TOTAL	**21**

Electives

Course Code	Course Title	Units
APH 815	Livestock Production Economics and Extension	3
APH 817	Animal Biotechnology	2
	TOTAL	**5**

SECOND SEMESTER

Course Code	Course Title	Units
APH 806	Advanced Ruminant Animal Management	2
APH 844	Advanced Animal Products and by- product Technology	3
APH 808	Animal Health and Disease Control	3
APH 810	Advanced Ethology	2
APH 800	Students' Seminar	2
APH 814	Feeds, feed production and feed mill management	3
APH 816	Livestock Farming Systems	3
APH 802	Research Techniques in Animal Production and Health	3
	TOTAL	**21**

Electives

Course Code	Course Title	Units
APH 818	Forage Resources and Utilization	3
	TOTAL	**3**

THIRD & FOURTH SEMESTER

Course Code	Course Title	Units
APH 899	Dissertation	12
	TOTAL	**12**

D. SUMMARY

1st Semester	21unit
2nd Semester	21units
3rd and 4th Semesters	12units
Total	**54units**

M. AGRIC TECH. PASTURE AND RANGE MANAGEMENT OPTION

A	**CORE COURSES:**	**UNITS**
i.	Biostatistics and Experimental Design	3
ii.	Research Techniques in Animal Production and Health	3
iii.	Computer Applications in Animal Production & Health	3
iv.	Advanced Monogastric Animal Management	2
v.	Advanced Ruminant Animal Management	2
	Sub-total	**13**

B	**REQUIRED COURSES**	**UNITS**
i.	Pasture Breeding and Genetics	3
ii.	Advanced Animal Nutrition	2
iii.	Advanced Pasture and Range Management	3
iv.	Laboratory Techniques and Instrumentation	3
v.	Forage Resources and Utilization	3
vi.	Forage Conservation and Quality	3
vii.	Feeds, Feed production and Feed mill Management	3
viii.	Animal Traction	2
ix	Seminar	2
x	Dissertation	12
Sub-total		**36**

FIRST SEMESTER

Course Code	Course Title	Units
APH 801	Biostatistics and Experimental Design	3
APH 803	Computer Application in Animal Production	3
APH 855	Advanced Monogastric Management	2
APH 809	Laboratory Techniques and Instrumentation	2
APH 837	Pasture Breeding and Genetics	3
APH 839	Advanced Pasture and Range Management	3
APH 805	Advanced Animal Nutrition	2
	TOTAL	**18**

SECOND SEMESTER

Course Code	Course Title	Units
APH 802	Research Techniques in Animal Production	3
APH 818	Forage Resources and Utilization	3
APH 806	Advanced Ruminant Management	2
APH 838	Forage Conservation and Quality	3
APH 814	Feeds, feed production and Feed mill Management	3
APH 840	Animal Traction	2
APH 800	Seminar	2
	TOTAL	**18**

THIRD & FOURTH SEMESTER

Course Code	Course Title	Units
APH 899	Dissertation	12
	TOTAL	**12**

D. SUMMARY

1st Semester	19units
2nd Semester	19units
3rd and 4th Semesters	12units
Total	**50 units**

M. AGRIC. TECH. ANIMAL MICROBIOLOGY OPTION

A	**CORE COURSES:**	**UNITS**
i.	Biostatistics and Experimental Design	3
ii.	Research Techniques in Animal Production & Health	3
iii.	Computer Applications in Animal Production & Health	3
iv.	Advanced Monogastric Animal Management	2
v.	Advanced Ruminant Animal Management	2
	Sub-total	**13**

B	**REQUIRED COURSES**	**UNITS**
i.	Advanced Virology	2
ii.	Advanced General Veterinary Microbiology	3
iii.	Advanced Animal Mycology and Mycoplasmology	3
iv.	Advanced Animal Biolotechnology	2
v.	Veterinary Laboratory Diagnosis and Instrumentation	2
vi.	Advanced Immunology	3
vii.	Advanced Systemic Bacteriology	3
viii.	Microbial Physiology	3
ix.	Dissertatioon	12
	Sub-total	**33**

A.	**Electives**	
i.	Advanced Pharmaceutical Microbiology	2
i.	Selected Topics in Animal Health and Preventive Medicine	3
ii.	Advanced Theriogenology	3
iii.	Microbial Genetics	3
	Sub-total	**11**

FIRST SEMESTER

Course Code	Course Title	Units
APH 801	Biostatistics and Experimental Design	3
APH 803	Computer Application in Animal Production & Health	3
APH 855	Advanced Monogastric Management	2
APH 845	Advanced Virology	2
APH 847	Advanced General Veterinary Microbiology	3
APH 849	Advanced Animal Mycology and Mycoplasmology	3
APH 817	Advanced Animal Biolotechnology	2
	TOTAL	**18**

Electives

Course Code	Course Title	Units
APH 853	Advalnced Pharmaceutical Microbiology	2
	TOTAL	**2**

SECOND SEMESTER

Course Code	Course Title	Units
APH 800	Seminar	2
APH 806	Advanced Ruminant Animal Management	2
APH 802	Research Techniques in Animal Production and Health	3
APH 804	Veterinary Laboratory Diagnosis and Instrumentation	2
APH 808	Animal Health and Disease control	3
APH 812	Advanced Immunology	3
APH 848	Advanced Systemic Bacteriology	3
APH 850	Microbial Physiology	3
	TOTAL	**21**

Electives

Course Code	Course Title	Units
APH 852	Advanced Theriogenology	3
APH 854	Microbial Genetics	3
	TOTAL	**6**

THIRD & FOURTH SEMESTER

Course Code	Course Title	Units
APH 899	Dissertation	12
	TOTAL	**12**

D. SUMMARY

1st Semester	21units
2nd Semester	18units
3rd and 4th Semesters	12units
Total units	**51**

M. AGRIC TECH. ANIMAL PARASITOLOGY OPTION

CORE COURSES:		**UNITS**
i.	Biostatistics and Experimental Design	3
ii.	Research Techniques in Animal Production	3
iii.	Computer Applications in Animal Production	3
iv.	Advanced Monogastric Animal Management	2
v.	Advanced Ruminant Animal Management	2
	Sub-total	**13**

B	**REQUIRED COURSES**	**UNITS**
i.	Laboratory Techniques and Instrumentation	3
ii.	Selected Topics in Animal Health and Preventive Medicine	3
iii.	Advanced General Parasitology	3
iv.	Biotechnology for Parasite Control	3
v.	Advanced Protozoology	3
vi.	Taxonomy of Parasites of Medical & Verterinary importance	3
vii.	Dissertation	12
	Sub-total	**30**

C. ELECTIVES

i.	Physiology and Biochemistry of Parasitic Diseases	3
ii.	Public Health and Sanitary Practices	3
iii.	Communicable Diseases and Vector Biology	3
iv.	Wild Life Parasitology	3
v.	Phytomedicine and Medical Parasitology	3
vi.	Transmission of Tropical Diseases	3
	Sub-total	**18**

FIRST SEMESTER Electives

Course Code	Course Title	Units
APH 801	Biostatistics and Experimental Design	3
APH 803	Computer Application in Animal Production &Health	3
APH 855	Advanced Monogastric Management (MAY BE DELETED)	2
APH 843	Advanced Parasitology	3
APH 841	Biotechnology for Parasite Control	2
APH 827	Advanced Protozoology	3
BIO 845	Taxonomy of Parasites of Medical and Verterinary importance	3
	TOTAL	**18**

Course Code	Course Title	Units
BIO 847	Physiology and Biochemistry of Parasitic Diseases	3
BIO 823	Public Health and Sanitary Practices	3
BIO 821	Communicable Diseases and Vector Biology	3
APH 856	Wild life parasitology	2
	TOTAL	**11**

SECOND SEMESTER

Course Code	Course Title	Units
APH 800	Seminar	2
APH 806	Advanced Ruminant Animal Management	2
APH 802	Research Techniques in Animal Production and Health	3
APH 804	Veterinary Laboratory Diagnosis and Instrumentation	2
APH 832	Applied Helminthology	3
APH 842	Immunology of Parasitic Infections	3
APH 865	Techniques in Molecular Parasitology	3
APH 834	Epidemiology of Parasitic Diseases	3
	TOTAL	**21**

Electiv es
THIRD & FOURTH SEMESTER

Course Code	Course Title	Units
APH 858	Ethnoveterinary Medicine	3
BCH 817	Phytomedicine and Medical Parasitology	3
BIO 842	Transmission of Tropical Diseases	3
	TOTAL	**9**

Course Code	Course Title	Units
APH 899	Dissertation	12
	TOTAL	**12**

D SUMMARY

1st Semester	18 units
2nd Semester	21 units
3rd and 4th Semesters	12 units
Total	**51 units**

FARM HYGIENE AND DISEASE PREVENTION OPTION

A	**CORE COURSES:**	**UNITS**
i.	Biostatistics and Experimental Design	3
ii.	Research Techniques in Animal Production	3
iii.	Computer Applications in Animal Production	3
iv.	Advanced Monogastric Animal Management	2
v.	Advanced Ruminant Animal Management	2
	Sub-total	**13**

B	**REQUIRED COURSES**	**UNITS**
i.	Meat, Milk and Fish Hygiene	2
ii	Zoonoses and Environmental Health	2
iii	Epidemiology of Farm Animal Diseases	2
iv	Advanced Farm and Abattoir Hygiene	2
v	Research Techniques in Animal Production and Health	3
vi	Veterinary Laboratory Diagnosis and Instrumentation	3
vii	Water Analysis	2
viii	Advanced Immunology	3
ix	Biodeterioration and Biodegradation	2
x	Advanced Economics	2
xi	Student's Seminar	2
xii	Dissertation	12
	Sub-Total	**37**

C	**ELECTIVES**	**UNITS**
i.	Advanced Animal Biotechnology (APH817)	2
ii.	Advanced Microbial Ecology (APH819)	2
iii.	Advanced Theriogenology (APH852)	2
iv	Biodeterioration and Biodegradation	2
v	Advanced Economics	2
	Sub-tota	**10**

FIRST SEMESTER
SECOND SEMESTER

Course Code	Course Title	Units
APH 801	Biostatistics and Experimental Design	3
APH 803	Computer Application in Animal Production	3

APH 855	Advanced Monogastric Management	2
APH 857	Meat, Milk and Fish Hygiene	2
APH 859	Zoonoses and Environmental Health	2
APH 861	Epidemiology of Farm Animal Diseases	2
APH 863	Advanced Farm and Abattoir Hygiene	2
	TOTAL	**16**

Course Code	Course Title	Units
APH 802	Research Techniques in Animal Production	3
APH 806	Advanced Ruminant Management	2
APH 804	Veterinary Laboratory Diagnosis and Instrumentation	3
APH 860	Water Analysis	2
APH 812	Advanced Immunology	3
APH 862	Biodeterioration and Biodegradation	2
APH 815	Livestock productioon Economics and Extension	2
APH 800	Student's Seminar	2
	TOTAL	**19**

LIST OF ACADEMIC STAFF

S/N	NAME OF ACADEMIC	POST	PHONE NO.
1.	Prof. A.N. Fajemisin	Professor	08033746415
2.	Prof. J.A. Alokan	Professor	08037208290
3.	Prof. I.A. Adebayo	Professor	08033636040
4.	Prof. G. E. Onibi	Professor	08033503320
5.	Prof. C.A. Chineke	Professor	08035855410
6.	Prof. J.O. Agbede	Professor	08064840143
7.	Prof. F.A. Igbasan	Professor	08034736991
8.	Prof. I.B. Osho	Professor	08034708795
9.	Prof. S.O. Aro	Professor	07062329254
10.	Prof. (Mrs) O.B. Faluyi	Professor	08061387047
11.	Prof. O.A. Adu	Professor	08037168590
12.	Prof. M. Adegbenro	Professor	08034935735
13.	Dr. (Mrs) G. A. Ibhaze	Snr. Lecturer	08055865289
14.	Dr. (Mrs) A.A. Akintomide	Snr. Lecturer	08036110363
15.	Dr.(Mrs) O.O. Adekolurejo	Lecturer I	08156330525
16.	Dr. A.O. Ayeni	Lecturer I	08038137442
17.	Dr. A.J. Atansuyi	Lecturer I	08034832175
18.	Dr. O.B. Omotoso	Lecturer I	08060186726
19.	Mr. O.D. Ilori	Lecturer II	08060687651
20.	Mrs. I.S. Olateju	Lecturer II	07034518939

9.1.4 DEPARTMENT OF CROP, SOIL AND PEST MANAGEMENT (CSP)

POSTGRADUATE COURSES IN THE DEPARTMENT OF CROP, SOIL AND PEST MANAGEMENT

a) **PGD (Crop, Soil and Pest Management)**

b) **M. Agric. Tech (Crop Management Technology)**
   i. Plant Systematics and Taxonomy
   ii. Plant Breeding and Genetics
   iii. Plant Physiology
   iv. Horticulture
   v. Agronomy
   vi. Farming System

c) **M. Agric. Tech (Soil Management Technology)**
   i. Soil Environmental Chemistry
   ii. Soil Fertility and Plant Nutrition
   iii. Soil Microbiology and Biochemistry
   iv. Soil Survey, Classification and Evaluation
   v. Soil Physics

d) **M. Agric. Tech (Pest Management Technology)**
   i. Crop Entomology (Agricultural Entomology and Storage Entomology) ii. Plant Pathology
   iii. Plant Nematology
   iv. Plant Virology
   v. Weed Management
   vi. Weed Biology and Ecology

e) **Ph.D. (Crop Management Technology)**
   i. Plant Systematics and Taxonomy
   ii. Plant Breeding and Genetics
   iii. Plant Physiology
   iv. Horticulture
   v. Agronomy
   vi. Farming System

f) **Ph.D. (Soil Management Technology)**
   i. Soil Environmental Chemistry
   ii. Soil Fertility and Plant Nutrition
   iii. Soil Microbiology and Biochemistry
   iv. Soil Survey, Classification and Evaluation
   v. Soil Physics

g) **Ph.D. (Pest Management Technology)**
   i. Crop Entomology
   ii. Plant Pathology
   iii. Plant Nematology
   iv. Plant Virology
   v. Weed Management
   vi. Weed Biology and Ecology
   vii. Plant Bacteriology

1. PROGRAMMES OFFERED

a) Postgraduate Diploma (PGD)
b) Master of Agricultural Technology (M.Agric. Tech)
c) Doctor of Philosophy (Ph.D.)

2. AVAILABLE OPTIONS/SPECIALIZATION

a) PGD in Crop, Soil and Pest Management
b) M.Agric. Tech. with specialization in:
   i. Crop Management Technology
   ii. Soil Management Technology
   iii. Pest Management Technology c) Ph.D. with specialization in:
   i. Crop Management Technology
   ii. Soil Management Technology
   iii. Pest Management Technology

3. PHILOSOPHY AND OBJECTIVES

The objective of postgraduate programmes in the Department is to train professionals in Crop, Soil and Pest Management, who will serve in both private and public sectors of the economy.

The philosophy of the programme is to provide functional education for postgraduate students who eventually after the training will be job makers and job creators, who in addition will be trainers of top level academic and masters of industrial sector.

4. ADMISSION REQUIREMENTS

a) Postgraduate Diploma (PGD)
   i. Candidates with a Higher National Diploma (HND) in agriculture or allied discipline at not less than Lower Credit level.
   ii. Candidates with a Third Class and above in any area of Agriculture or related disciplines from recognized Universities.

b) Master of Agricultural Technology (M. Agric Tech.) in Crop, Soil and Pest Management

i. Candidates must possess five (5) Credits at WASCE or SSCE or GCE at a maximum of two sittings with credit in English Language, Chemistry, Biology or Agricultural Science, Mathematics or Statistics and Physics.
ii. Candidates with PGD (Upper Credit or Distinction)
iii. Candidates with first degree in Agriculture and related disciplines with a minimum Second Class Lower Division.

c) Doctor of Philosophy (Ph.D.)

Candidates with M.Agric. Tech/M.Tech/M.Sc. in Agricultural and related disciplines from other recognized institutions with a CGPA of not less than 3.50 or 60% in the overall result. Where applicable, the candidate may be required to score not less than 60% in the oral thesis examination.

5. DURATION OF THE PROGRAMME

a) PGD

The academic programme, which will be on a part-time basis, includes a course work and a supervised research project and both will cover a minimum period of three (3) semesters.

b) M.Agric.Tech.: Full time 18 months – 24 months
c) Ph.D:Full time: 36 months – 48 months

Part time: 48 months – 72 months

(In all cases, Senate may extend the duration as it deems fit and necessary. On application, candidates may be granted extension on programme duration subject to approval of Senate).

6. REQUIREMENTS FOR GRADUATION

a) PGD

To be eligible for the award of PGD, a candidate must have passed 30 units of course work, including 6 units of Research Project.

b) M. Agric. Tech.

M.Agric. Tech. in the area of specialization is awarded to a candidate who has

i. Accumulated a Total Load Unit (TLU) of 36 including 12 units of thesis Research, 18 units of 6 Compulsory or core courses and 6 units of Electives.
ii. Successfully presented a minimum of two (2) Departmental Research Project Seminars.
iii. Successfully defended at an oral examination organized by the School of Postgraduate Studies (SPGS).

c) Ph.D.

A candidate is awarded a Ph.D. degree after he has successfully:

i. Completed any prescribed course work;
ii. Presented three (3) Departmental Research Project Seminars;
iii. Defended the Research Thesis in a specialized area at an oral examination organized by SPGS.

7. COURSE OUTLINE

a) PGD

FIRST SEMESTER

Course Code	Course Title	T	L	P	U
CSP 701	Biometry	2	0	0	2
CSP 703	Soil and and Plant Analysis	1	0	3	2
CSP 705	Plant Pathology	1	0	3	2
CSP 707	Entomology	2	0	3	2
CSP 709	Soil Classification and Survey	2	0	3	3
	TOTAL	**7**	**0**	**12**	**11**

SECONDSEMESTER

Course Code	Course Title	T	L	P	U
CSP 702	Principles of Crop Husbandry	1	0	0	1
CSP 704	Soil Fertility and Chemistry	3	0	3	3
CSP 706	Weed Biology and Ecology	2	0	3	2
CSP 708	Cytogenetics and Plant Breeding	3	0	3	3
CSP 710	Information Retrieval	2	0	2	2
	TOTAL	**11**	**0**	**9**	**11**

THIRD SEMESTER

Course Code	Course Title	T	L	P	U
CSP 799	PGD Research Project	0	0	0	6

b) M.AGRIC. TECH

FIRST SEMESTER

CROP MANAGEMENT OPTION

Course Code	Course Title	T	L	P	U
CSP 801	Statistics and Agric Experimentaion	2	0	0	2
CSP 803	Agroclimatology and Plant Physiology	2	0	0	2
CSP 805	Advanced Plant Nutrition	2	0	3	3
CSP 807	Advanced Genetics	2	0	0	2
CSP 809	Advanced Crop Husbandry	2	0	0	2
CSP 811	Biometrical Genetics	2	0	0	3
CSP 813	Advanced Plant Breeding and Biotechnology	2	0	0	3
CSP 831	Information Retrieval	1	0	0	1
	TOTAL	**11**	**0**	**3**	**19**

SOIL MANAGEMENT OPTION

Course Code	Course Title	T	L	P	U
CSP 801	Statistics and Agric. Experimentation	2	0	0	2
CSP 803	Agroclimatology and Plant Physiology	2	0	0	2
CSP 805	Advanced Plant Nutrition	2	0	3	3
CSP 815	Vertical Farming Systems and Application of Nanotechnology in Soil Science	2	0	0	3
CSP 817	Advanced Soil Biotechnology	2	0	0	3
CSP 819	Advanced Soil Chemistry	2	0	0	3
CSP 831	Information Retrieval	1	0	0	1
CSP 833	Soil Microbiology and Ecology	2	0	0	2
	TOTAL	**15**	**0**	**3**	**19**

PEST MANAGEMENT OPTION

Course Code	Course Title	T	L	P	U
CSP 801	Statistics and Agric Experimentation	2	0	0	2
CSP 803	Agroclimatology and Plant Physiology	2	0	0	2
CSP 821	Functional Morphology and Taxonomy of Insect	2	0	3	3
CSP 823	Insect Physiology and Biochemistry	2	0	0	2
CSP 825	Advanced Crop Protection	2	0	3	3
CSP 827	Advances in Plant Pathology	2	0	3	3
CSP 829	Pesticides Use and Health		0	0	3
CSP 831	Information Retrieval	1	0	0	1
	TOTAL	**13**	**0**	**3**	**19**

SECOND SEMESTER

CROP MANAGEMENT OPTION

Course Code	Course Title	T	L	P	U
CSP 802	Advanced Seed Production Technology	2	0	0	2
CSP 804	Applied Horticulture	2	0	0	2
CSP 806	Soil Plant Relations	2	0	3	3
CSP 808	Methods of Soil and Plant Analysis (Practical)	2	0	3	3
CSP 820	Advanced Soil Fertility and Fertilizer Use	2	0	3	3
CSP 826	Integrated Pest Management	2	0	0	2
CSP 834	Agricultural Insect Pests and their Management	2	0	3	3
	TOTAL	**14**	**0**	**12**	**18**

SOIL MANAGEMENT OPTION

Course Code	Course Title	T	L	P	U
CSP 808	Methods of Soil and Plant Analysis (Practical)	2	0	6	3
CSP 810	Soil Survey and Classification	3	0	0	3
CSP 812	Mineralogy	2	0	3	3

CSP 814	Advanced Soil Physics	2	0	3	3
CSP 816	Advanced Soil Management and Conservation	2	0	0	2
CSP 830	Advanced Soil Biochemistry	2	0	0	2
CSP 820	Advanced Soil Fertility and Fertilizer Use	2	0	2	2
	TOTAL	**15**	**0**	**14**	**18**

PEST MANAGEMENT OPTION

Course Code	Course Title	T	L	P	U
CSP 802	Advanced Seed Production Technology	2	0	0	3
CSP 822	Ecology and Epidemiology of Plant Diseases	2	0	3	3
CSP 824	Advanced Weed Science	2	0	3	2
CSP 826	Integrated Pest Management	2	0	0	2
CSP 828	Insect Ecology	2	0	3	3
CSP 834	Agricultural Insect Pests and their Management	2	0	3	3
CSP 832	Chemistry and Mode of Action of Agrochemicals	2	0	3	3
	TOTAL	**14**	**0**	**15**	**19**

THIRD SEMESTER

Course Code	Course Title	T	L	P	U
CSP 899	Master Thesis Research Project	0	0	0	12

c) Ph.D.
CSP 999 Doctoral Research Project

8. COURSE SYNOPSES
A. PGD
CSP 701: Biometry – 2 Units
Analysis of variance. Regression and correlation. Multiple and curvilinear regression. Analysis of frequencies, field experimental design. Data analysis using statistical software packages: spss, genstat, stata etc.

CSP 702: Principles of Crop Husbandry – 1 Units
Principles of perennial crop production including establishment, nutrition, pests and diseases, principles of production of short-term crops with reference to cereals, root and tuber crops, vegetables and miscellaneous crops.

CSP 703: Analytical Techniques for Soil and Plant – 2 Units
Determination of soil physical properties. Sample collection and preparation. Determination of organic matter, N, P, K, Ca and Mg. Chemical analysis of plant tissue for elements (Laboratory).

CSP 704: Soil Fertility and Chemistry – 3 Units
Plant growth requirements. Cation exchange capacity. Soil acidity and liming. Plant nutrients and their chemistry in soil. Diagnosing nutrient deficiencies. Routine soil testing, fertilizers.

CSP 705: Plant Pathology – 2 Units
Microorganisms affecting field crops. Diseases of field crops (Bacteria, Fungi, Virus, Nematodes), their identification, significance and control.

CSP 706: Weed Biology and Ecology – 2 Units
Characteristics of weeds. Classification, distribution and factors favouring spread of weeds. Principles of weed ecology. Weed-crop interactions including competition and factors influencing competition. allelopathy and types.

CSP 707: Entomology – 2 Units
Types of crop pests. Pest damage. General principles of insect control. Vertebrate pests control. Insecticides; their mode of action and resistance of pests to insecticides.

CSP 708: Cytogenetics and Plant Breeding – 3 Units
Cell organization. Variation and chromosome number. Chromosome aberration and structural modifications. Mutation. Cytoplasmic inheritance. Incompatibility and plant breeding. Male sterility. Polyploidy. Methods of plant improvement.

CSP 709: Soil Survey and Classification – 3 Units Factors of soil formation. Soil survey methods. Definition of mapping units. Classification systems. Soil description. Classification of Nigerian soils. Land capability classification. Field and laboratory exercises.

CSP 710: Information Retrieval – 2 Units
Paper and oral presentation of selected topic in any aspect of crop production.

CSP 799: PGD Research Project – 6 Units
Research Project Relevant to Individual Candidate's Area of Interest or Specialization E.G. Crop Management, Crop, Pest Management and Soil Management.

B. M.AGRIC. TECH.

CSP 801: Statistics and Agricultural Experimentation – 2 Units
Review of basic statistical concepts, probability. Samples from a normal distribution. Comparisons involving two sample means, principles of experimental design. analysis of variance, multiple comparisons, linear regression and correlation, multiple and partial regression and correlation, factorial experiments, analysis of covariance, curvilinear relations, analysis of counts, non-parametric statistics, probit analysis, data analysis using statistical software packages, - EXCEL, SPSS, Genstat, Suplus etc. Field experimental design.

CSP 803: Agro-Climatology and Plant Physiology -2 Units
Elements of weather and climate, effects of radiation on plants, photoperiodic responses in plants, effects of temperature on soil and plants, energy and water exchanges in the soil-plant atmosphere continuum, water relations and photosynthesis, consumptive water use (evapotranspiration) by plants and measurement approaches, water balance, water and yield relationships.

CSP 804: Applied Horticulture – 2 Units
General nursery techniques; types of parks and garden (public, recreational and sporting facilities); their nature, management and administration, techniques of production and uses and handling of ornamental plants; principle and elements, acceding, diversity, appearance and economy in landscape design and design processes; principles of vegetable production, post-harvest physiology of fruits and vegetables.

CSP 805: Advanced Plant Nutrition – 3 Units
Sources and nature of plant nutrients, problem of inadequate plant nutrition, mechanisms of nutrient availability and uptake, role of soil organic matter and clay. Biological nitrogen fixation, integrated nutrient supply, plant nutrient sources. Chemistry of phosphorus and potassium in soil.

CSP 806: Soil-Plant Relations – 3 Units
Forms and sates of water in soil, soil water energies, retention of water in soil, movement and uptake of water and nutrients in soil, development and functioning of plant roots, soil water infiltration and evaporation, weather, soil and plant factors affect soil water availability, irrigation: principles and methods.

CSP 807: Advanced Genetics – 2 Units
Cell and its structure, mitosis; meiosis and gamete formation; genetic materials, properties and replication; variation in genome structure; mendelian, molecular and population genetics; vegetative propagation; artificial hybridization; pollen transfer, protoplasmic fusion and gene manipulation; application of principles of population genetics to plant breeding.

CSP 808: Methods of Soil and Plant Analysis (Practical's) – 3 Units
Sample preparation. Extraction, instrumentation (flame photometer, spectrophotometer, atomic absorption). Determination of macro and micro elements.

CSP 809: Advanced Crop Husbandry – 2 Units
The plant system, soil and crop nutrition, agronomic practices and systems, crop pests and pathogens, principles of plantation/perennial crop production, principles of annual crop (short term) crop production (cereals, root and tuber crops, sugarcane, oilseeds and pulses, tobacco, fiber and vegetable crop).

CSP 810: Soil Survey and Classification – 3 Units
Factors of soil formation. Soil survey methods. Definition of mapping units. Classification systems, soil description. Classification of Nigerian soils. Land capability classification, field and laboratory exercises.

CSP 811: Biometrical Genetics – 3 Units
Introduction. Statistical concepts and procedures, gene effects, means and variances estimation of genetic parameters – generation mean analysis, diallel analysis, biparental progenies and mating designs i, ii and iii, selection, 3-way and double cross hybrids, line x tester analysis; classification analysis. Genotype x environment interactions - joint regression analysis; stability models, path analysis and selection models.

CSP 812: Mineralogy – 3 Units
Rocks and minerals, soil colloids, clay mineralogy, introduction to crystal chemistry, atomic models of mineral and crystal, introduction to non-silicates.

CSP 813: Advanced Plant Breeding and Biotechnology – 3 Units
Gene action, variance components; heritability, inbreeding and heterosis; reproductive systems; incompatibility; male sterility; selection methods for self-pollinated crops; selection methods for cross pollinated crops; other methods of crop improvement; genotype x environment interaction. Hybrids, synthetics; conservation of genetic resources. Biotechnology in crop improvement; molecular markers and marker-assisted selection

CSP 814: Advanced Soil Physics – 3 Units
Effects of soil physical properties on plant, soil structure, texture, consistency, bulk density, temperature, soil water relationship, factors affecting infiltration, saturation flow, unsaturated flow, vapour transfer, soil water movement.

CSP 815: Vertical Farming Systems and Application of Nanotechnology in Soil Science – 3 Units
Vertical farming systems, explain the types and how it works, its advantages and disadvantages, vertical farming technologies (hydroponics, aeroponics and aquaponics). nanotech; scope, concept and basics of nano-science andnanotechnology, synthesis of nanoparticles, types and classification of nanoparticles and the nanotechnology application and effects on soil and environment.

CSP 816: Advanced Soil Management and Conservation – 2 Units
Soil resources of the tropics and other properties, soil degradation in the tropics , principles of soil resources management, shifting cultivation, ecological compatible land clearing methods (conservation tillage), mulch farming, cover crops, agroforestry, principles of erosion and control methods

CSP 817: Advanced Soil Biotechnology – 3 Units
Soil ecology, overview of soil organisms, explain the features of ecosystem, soil fauna, macro and microfauna, effect of cover crops on the soil biological community. soil biotechnology; advantages and application of in soil, biotechnology for waste water treatment, biological processes in soil, biological method for soil remediation, endophytes in biotechnology and agriculture, biocontrol and biofertilization, plant growth promoting rhizobacteria (pgpr) for sustainable agriculture, role of pseudomonas aurantiaca in crop improvement, bacterial inoculants for field applications.

CSP 830: Advanced Soil Biochemistry – 3 Units Enzymes Definitions, Enzymes Classification and Nomenclature, Soil Enzymes Importance and application in Agriculture, Kinetics of Enzyme Reactions in Soil, Enzyme Inhibition, Enzyme Immobilization, Soil enzyme assay, Factors affecting enzyme assay, Rhizosphere biochemistry, Omics in soil science, Soil forensics.

CSP 819: Advanced Soil Chemistry – 3 Units
Characteristics of the natural soil system, types of reaction in soil chemistry, application of chemical thermodynamics to soil, kinetic vs thermodynamic approach to changes and equilibrium, basic thermodynamic relationship, redox potential and equilibrium constant, primary soil minerals, secondary soil minerals, specific surface of soil minerals, surface charge of soil minerals, CEC of secondary soil minerals, organic components, concentration relations, aluminium and soil acidity, carbonate system, soil phosphates, solid-solution interphase.

CSP 820: Advanced Soil Fertility and Fertilizer Use – 3 Units
Inorganic fertilizers, fertilizer application methods, fertilizer calculations, soil testing, soil acidity and alkalinity, liming, nutrient cycling through organic sources.

CSP 821: Functional Morphology and Taxonomy – 3 Units
The arthropods plan and body division, the components of external structure of insects: the integuments, tagmosis- the head, thorax and abdomen, organization and evolution of the insect head and mouth parts, orientations of insect head, thorax and the attached appendages (wings and legs), modifications of mouth parts in insect, the antennae and forms of antennae, leg and leg modifications, wing and sound production, wing muscles and flight, spiracles and its modification, abdomen, processes of abdomen and its appendages. Insect phylogeny and classification, its importance, insect orders and their specific features use in identification. Formation of complexes in insect orders.

CSP 822: Ecology and Epidemiology of Plant Diseases – 3 Units
The concepts in ecology and epidemiology of disease, meaning of plant diseases, Koch's postulate and its application in plant diseases diagnosis, differences in signs and symptoms, diseases, disorders and their agents, inoculums' potential, disease epidemiology, the role of enzymes in plant disease development, nutrition of plant pathogens, physiology of a diseased plant, disease resistance in plants and modern methods of plant disease detection

CSP 823: Insect Physiology and Biochemistry – 2 Units
The internal structure of insects: consideration of the body systems, insect nutrition and digestive system and others includes circulatory, excretory, respiratory, muscular, sensory, nervous and reproductive systems. Advanced knowledge in insect growth, development and mechanisms of survival. Integument and molting, hormones and development, insect flight, sources of energy for flight in insect, food chemistry, chemistry of pesticides and chemical cycles, immunity and insect semiochemicals,

CSP 824: Advanced Weed Science – 2 Units
Weed biology and ecology; weed management strategies and environmental impact; physiology and biochemistry of herbicide selection; research methods; pesticide toxicology.

CSP 825: Advanced Crop Protection – 3 Units Concepts of pest, pathogenicity and weediness, economic levels, sampling, monitoring and forcasting, yield loss assessment, components of insect pest, diseases and

weed management, cultural, ecological, chemical, physical and mechanical controls. Interference methods, host-plant resistance, quarantine, legislation and politics, Integrated Pest Management (IPM), formulations in insecticides, fungicides, herbicides and nematicides. Principle of stored products pest control.

CSP 826: Integrated Pest Management (IPM) – 2 Units
Historical perspectives, definition and explanation of terms, components or instruments of IPM, hinderances to IPM in developing countries, examples of IPM in crop protection-insects, diseases and weeds.

CSP 827: Advances in Plant Pathology – 3 Units
Laboratory practices in plant pathology, Dissemination of plant pathogens, Stages in infection, establishment and disease development of fungal, bacterial and viral plant diseases, Virus purification and replication, Virus/vector and host relationship in viral diseases of plants. Nitrifying and nitrogen fixing bacteria as beneficial biotrophs, Plant growth promoting microbes and their mechanism of action, Mechanism of crop infection by nematodes and Nematode/microbes interactions.

CSP 828: Insect Ecology - 3 Units
Concepts of ecology, ecosystem of ecology, environmental change and disturbances, ecosystem approach to insect ecology, responses to abiotic conditions, factors affecting dispersal behaviour. Population ecology: Density, dispersion, age structure, sex ratio. Population processes: Natality, mortality, dispersal. Life history characteristics, population dynamics. Factors affecting population size: Density-independent factors, density-dependent, regulatory mechanism. Models of population change: Exponential and geometric models, logistic models. Species interactions: classes of interactions- Competition, predation and symbiosis. Factors affecting interactions: Abiotic conditions, resource availability and distribution, effects of other species. Population and community regulation.

CSP829: Pesticides Use and Health – 3 Units
History of pesticide use. Types of pesticides and their applications. Pesticide misuse and abuse. Health impact of pesticides. Factors for aggravated health hazards from pesticide use in Nigeria. Specific health impacts of pesticides on people. Acute poisoning. Chronic poisoning. Neurobehavioral effects. Developmental and re productive effects. Carcinogenic effects. Immunological effects. Other problems and issues with pesticides. Disruption of ecological balance and collapse of biodiversity: unsustainable chemical reliance. Pesticide resistance. Economic issues, stemming the influence of the chemical industry.

CSP831: Information Retrieval – 1
Paper and oral presentation of selected topics in any aspect of crop production

CSP833: Soil Microbiology and Ecology – 2
Bacterial metabolism, mineralization and immobilization, nitrification and denitrification, fe bacteria, symbiotic nitrogen fixation, cycle of elements in soil, microbial ecology, rhizosphere.

CSP 834: Agricultural Insect Pests and their Management – 3 Units
Definition of pest, development of pest status, factors promoting development of pest status. Field insect pests of commercially important agricultural crops; insect pests of cereal, legumes, tuber and root crops, insect pest of cash crops- cocoa, kola, coffee, oil palm, sugar cane. Insect pest of vegetable- leafy and fruit vegetables. Insect pests of stored products, classes of insect pest; primary and secondary insect pests, regular, occasional and spontaneous insect pests. Damage and stage of insect that causes the damage. Management/control strategies-physical/mechanical, cultural, biological, biotechnological, host plant resistance, chemical and Integrated Pest Management (IPM) strategy.

CSP 832: Chemistry and Mode of Action of Agrochemicals – 3 Units
Herbicides and its application. Modes of action. Photosynthesis. Amino acid biosynthesis. auxin- type herbicides. Lipid biosynthesis inhibitors. Cell division inhibitors. Inhibitors of cell elongation. Miscellaneous modes of action. Living systems for weed and insect control. Herbicide selectivity. Herbicide resistance.
Insecticides. Biochemical modes of action. Insect nervous system disruption. Inhibition of oxidative phosphorylation. Insect growth and regulation. Other insect control strategies. Naturally occurring compounds. Transgenic crops. Fungicides. Mode of action and selectivity. General cell toxicants. Sterol biosynthesis inhibitors.
glycerophospholipid biosynthesis inhibitors. Nucleic acid biosynthesisinhibition. Tubulin biosynthesis inhibition. Chitin biosynthesis inhibition. Melanin biosynthesis inhibition. Protein biosynthesis inhibition. Respiration inhibition. Interference with cell membrane structure. Undefined mode of action. Plant growth regulators.

CSP 899: Master Thesis Research Project – 12 Units
Research project relevant to the option chosen by individual candidate in consultation with the supervisor e.g. Crop Management, Crop Pest Management and Soil Management.

C. Ph.D.

CSP 999: Doctoral Research Project

Research project relevant to individual candidate's are of specialization e.g. Plant Physiology, Crop Entomology, Soil Fertility Management, Weed Science and Plant Breeding.

LIST OF ACADEMIC STAFF

S/N	Name	Status	Area of Specialization	Phone No.
1	Prof. B.S. Ewulo	Professor HOD	Soil Fertility and Classification	08035674245
2	Prof. M.A.K. Smith	Professor	Weed Science/Agronomy	08034006729
3	Prof. R.D. Aladesanwa	Professor	Chemical Weed Control/ Plant Protection	08034404278
4	Prof. S.O. Agele	Professor	Soil-Plant Relation/Plant Physiology	08035784761
5	Prof. B.O. Akinyele	Professor	Plant Genetics and Biosystematics	08034730675
6	Prof. M.A. Awodun	Professor	Soil Fertility and Plant Nutrition	07066293009
7	Prof. O.P. Aiyelari	Professor	Agronomy/Farming System	08033932320
8	Prof. A.C. Odiyi	Professor	Plant Breeding and Genetics	08034261299
9	Prof. (Mrs) A.I. Okunlola	Professor	Horticulture	08034435717
10	Prof. (Mrs) J.E. Idoko	Professor	Crop Protection Entomology	08034725952
11	Prof. (Mrs) M.O. Oni	Professor	Stored Product Entomology/Crop Protection Entomology	08034300943
12	Prof. R.A. Adebayo	Professor	Crop Protection/Applied Entomology	07068661128
13	Prof. I.B. Famuwagun	Professor	Pant Physiology/ Agronomy	08033637253
14	Dr. A.J. Adeyemo	Reader	Soil Environmental Chemistry	08037800551
15	Dr. S.A. Adejoro	Reader	Soil Microbiology and Biochemistry	08068866205
16	Dr M.A. Ajayi	Senior Lecturer	Plant Pathology	08132158030
17	Dr L.S. Fayeun	Senior Lecturer	Plant Breeding and Seed Technology	08030632197

9.1.5 DEPARTMENT OF ECOTOURISM AND WILDLIFE MANAGEMENT (EWM)

(1) PROGRAMMES OFFERED

(a) Postgraduate Diploma
(b) Masters in Ecotourism and Wildlife Management (M. Agric. Tech.)
(c) Doctor of Philosophy (Ph.D.)

(2) AVAILABLE OPTION

(a) Postgraduate Diploma (PGD) in Ecotourism and Wildlife Management
(b) M. Agric. Tech. with options in
  (i) Wildlife Ecology and Range Management
  (ii) Biodiversity Conservation and Management
  (iii) Wildlife Nutrition and Production
  (iv) Ecotourism and Hospitality Management
(c) Ph.D. with specialization
  (i) Wildlife Management
  (ii) Range Management
  (ii) Biodiversity and Conservation
  (iii) Wildlife Nutrition and Production
  (iv) Ecotourism Management
  (v) Hospitality Management

(3) PHILOSOPHY AND OBJECTIVES

The objective of postgraduate programmes in Ecotourism and Wildlife Management is to provide functional education for postgraduate students who eventually after the training will become job makers and job creators, who in addition will be trainers of top level academics and Masters of industrial, environmental and conservation sector.

The academic programme is focused towards advancement of knowledge in Ecotourism, Environmental and Biodiversity Management as well as Wildlife Management techniques for food production and environmental sustainability.

Programme Objectives

The major objectives of the programme are to:

(i) provide advanced education and training in the Science and Technology of Wildlife resources, environmental impact assessment, ecotourism and biodiversity management to cater for the high level manpower requirement of the nation;
(ii) provide functional education for the postgraduate students at Master and Postgraduate Diploma levels who will eventually become job makers;
(iii) provide opportunity for problem solving research students focused on wildlife production and utilization, ecotourism and provision of the necessary raw materials for the national tourism industries in this sub sector;
(iv) offer to the public the results of research and foster the practical application of these results; and (v) provide advanced studies and higher training in environmental impact assessment, management of national biodiversity, ecotourism destinations and national parks.

4. ADMISSION REQUIREMENTS

(a) Postgraduate Diploma (PGD)

(i) Candidates with a Higher National Diploma (HND) in Wildlife Management, Ecotourism Management, Tourism, Environmental Management, Forestry or allied disciplines at not less than Lower Credit level.

(ii) Candidates with a Third Class and above in Ecotourism and Wildlife Management or related disciplines from recognized Universities.

(b) Master of Agricultural Technology (M. Agric. Tech.) in Ecotourism and Wildlife Management.

(i) Candidates with PGD (Upper Credit or Distinction) in Ecotourism and Wildlife Management.
(ii) Candidates with first degree in Ecotourism, Wildlife or Wildlife combined or botany, zoology, biology or other related disciplines with a minimum of Second Class Lower Division.

(c) Doctor of Philosophy

Candidates with M. Agric. Tech. / M. Tech./M. Sc. in Ecotourism, Wildlife or Wildlife combined or botany, zoology, biology or other related disciplines from other recognized institutions with a CGPA of not less than 3.50 or 60% in the overall result. Where applicable, the candidate may be required to score not less than 60% in oral thesis examination.

(5) DURATION OF THE PROGRAMME

(a) PGD

The academic programme, which will be on part-time basis, includes a course work and a supervised research project and both will cover a minimum period of three (3) semesters.

(b) M. Agric. Tech.:
Full time: 18 months
Part time: 24 months

c) Ph.D.:
Full time: 36 months
Part time: 48 months

(On application, candidates may be granted extension on programme duration subject to approval of Senate).

6. REQUIREMENTS FOR GRADUATION

(a) Postgraduate Diploma

To be eligible for the award of PGD, a candidate must have passed 36 units of course work, including 6 units of Research Project.

(b) M. Agric. Tech.

M. Agric. Tech. in the area of specialization is awarded to a candidate who has:

(i) accumulated a Total Load Unit (TLU) of 36 including 12 units of Thesis Research and 24 course units;
(ii) successfully presented a minimum of two (2) Departmental Research Project Seminars;
(iii) successfully defended the Research Thesis in the specialized area at an oral examination organizedby the School of Postgraduate Studies (SPGS).

(c) Ph. D

A candidate is awarded a Ph.D degree after he has successfully

(i) Completed any prescribed course work;
(ii) presented three (3) Departmental ResearchProject Seminars;
(iii) defended the Research Thesis in a specialized area at an oral examination organized by the SPGS

7. COURSE OUTLINE

(a) P G D

FIRST SEMESTER

Course Code	Course Title	T	L	P	Units
EWM 751	Principle of Ecotourism	0	3	0	3
EWM 753	Wildlife Domestication and Ranching	0	2	1	3
EWM 755	Research Methods and Statistics	0	3	0	3
EWM 757	Ecotourism Event Management	0	3	0	3
EWM 759	Rainforest and Savanna	0	2	1	3
EWM 761	Field Trip	0	0	0	2
	TOTAL	**0**	**13**	**2**	**17**

SECOND SEMESTER

Course Code	Course Title	T	L	P	Units
EWM 750	Seminar	0	0	0	2
EWM 752	Zoo and Museum Management	0	2	0	3
EWM 754	Ecotourism Products, Marketing and Publicity	0	3	0	3
EWM 756	Advanced Wildlife Ecology	0	2	1	3
EWM 758	Natural Resources Conservation	0	3	0	3
EWM 760	Conflict Resolution in Wildlife and Ecotourism Management	0	0	0	3
	TOTAL	**0**	**10**	**1**	**17**

THIRD SEMESTER

Course Code	Course Title	T	L	P	Units
EWM 799	PGD Research Project	0	0	0	6
	TOTAL	**0**	**0**	**0**	**6**

(b) M.TECH

FIRST SEMESTER

Core Courses

Course Code	Course Title	T	L	P	U
FWT 801	Statistics and Experimental Design	0	2	0	2
EWM 803	Habitat management	0	1	3	2
EWM 805	Animal Ecology	0	2	0	2
EWM 807	Animal Capture Techniques	0	1	3	2
EWM 809	Field Trip	0	0	6	2
	TOTAL	**0**	**6**	**12**	**10**

Wildlife Ecology and Management Option

Course Code					
EWM 811	Range Ecology and Management	0	1	3	2
EWM 813	Population Dynamics	0	2	0	2
EWM 815	Wetland and Avian Conservation	0	1	3	2
	TOTAL	**0**	**4**	**6**	**6**

Biodiversity Conservation and Management Option

Course Code	Course Title	T	L	P	Units
EWM 815	Wetlands and Avian Conservation	0	2	0	2
EWM 821	Environmental Survey and Data Indices Production	0	1	1	2
EWM 823	Land Use Planning for Conservation	0	2	0	2
	TOTAL	**0**	**5**	**1**	**6**

Wildlife Nutrition and Production Option

Course Code					
EWM 809	Range Ecology and Management	0	1	3	2

EWM 831	Advanced Wildlife Nutrition	0	2	0	2
EWM 833	Feed Formulation Technology	0	1	3	2
EWM 835	Wild Animal Resources and Utilization	0	2	0	2
	TOTAL	**0**		**6**	**6**	**8**

Ecotourism and Hospitality Management Option

Course Code	Course Title	T	L	P	Units
EWM 813	Wetlands and Avian Conservation	0	2	0	2
EWM 841	Ecotourism and Recreational Planning	0	2	0	2
EWM 843	Park and Environmental Interpretation	0	2	0	2
EWM 845	Advanced Ecotourism Marketing and Publicity	0	2	0	2
	TOTAL	**0**	**8**	**0**	**8**

Electives

Course Code	Course Title	T	L	P	Units
EWM 817	Conservation Biogeography	0	2	0	2
EWM 819	Protected Area Planning and Management	0	2	0	2
	TOTAL	0	4	0	4

SECOND SEMESTER

Course Code	Course Title	T	L	P	Units
EWM 800	Seminar		0	0	6	2
EWM 802	Research Techniques in Ecotourism and Wildlife Management	0	1	3	2
EWM 804	Wildlife Policy and Administration	0	2	0	2
EWM 806	Wildlife Extension, Communication and Community Development	0	1	1	2
	TOTAL	**0**	**4**	**6**	**8**

Wildlife Ecology and Management Option

Course Code	Course Title	T	L	P	Units
EWM 810	Advanced Zoo and museum Management	1	1	0	2
EWM 812	Conservation genetics	0	2	0	2
EWM 814	Remote sensing and GIS	0	1	1	2
	TOTAL		**1**	**4**	**1 6**

Biodiversity Conservation and Management Option

Course Code	Course Title	T	L	P	Units
EWM 820	Community Participation in Renewable Resource Management	0	2	0	2
EWM 822	Eco-toxicology and Waste Management	0	2	0	2
EWM 824	Management of Endangered Species	0	2	0	2
	TOTAL	**0**	**6**	**0**	**6**

Wildlife Nutrition and Production Option

Course Code	Course Title	T	L	P	Units
EWM 830	Wildlife Diseases and Parasitology	0	2	0	2
EWM 832	Animal Physiological Adaptation	0	2	0	2
EWM 814	Mini-livestock Production	0	1	3	2
EWM 836	Apiculture		0	1	3	2
	TOTAL	**0**	**6**	**6**	**8**

Electives

Course Code	Course Title	T	L	P	Units
EWM 816	Natural Resource Economics and Enterprise Development	0	2	2	2
EWM 818	Game Ranching and Domestication	0	1	3	2
EWM 826	Environmental Impact assessment and Auditing	0	1	3	2
	TOTAL	**0**	**4**	**8**	**6**

THIRD SEMESTER

Course Code	Course Title	T	L	P	Units
EWM 899	Master's Thesis Research Project	0	0	18	12
	TOTAL	**0**	**0**	**18**	**12**

9. COURSE SYNOPSES

POSTGRADUATE DIPLOMA IN ECOTOURISM AND WILDLIFE MANAGEMENT

EWM 750: Seminars (2 Units)
Students will be expected to carry out literature review on recent developments in an area of current interests in the field of Ecotourism and Wildlife Management. The area of the review should not be directly related to the student's research project. An oral presentation of the review will be presented at an organized departmental seminar. The review must be typed, bound and submitted to the department for assessment.

EWM 751: Principles of Ecotourism (3 Units) Scope and meaning of ecotourism, components of ecotourism, sectors of ecotourism, elements and indicators of ecotourism , purpose of ecotourism, benefits and importance of ecotourism, The course examines the emerging area of eco-tourism in both developing and developed nations. The issues discussed involve the purpose of eco-tourism, importance to GDP, infrastructure demands, return on investment, and the possible financial strains and returns to local areas. The course provides a thorough examination of potential benefits as well as liabilities of eco-tourism to the region, indigenous population, and nation as well as who can gain and who can lose from such undertakings.

EWM 752: Advanced Zoos and Museum Management (3 Units)
Planning and Design of zoological gardens, capture and transportation of wild animals. Health, handling and care of wild animals in captivity. Amusement infrastructures in zoos and nature interpretation. Feeding of animals, zoo sanitation. Control of visitors. Collection, preservation and exhibition of wild animal specimens in museums for educational and recreational purposes. Financial control and personnel management. Problems and prospects of zoo and museum management in Nigeria.

EWM 753: Wildlife Domestication and Ranching (3 Units)
Characteristics features in various wild animal species that qualify them for meat production. Captive breeding and propagation of the identified animal species of Nigerian origin. Breeding systems; selection methods, sex determination; Establishing and development of Cross-breeding programme; farm animal domestication and ranching of the ungulate with potentials for meat and hide production.

EWM 754: Ecotourism Products, Marketing and Publicity (3 Units)
Products: Identifying products, developing partnerships, tapping local knowledge, research, zoning, policies and guidelines, educating and marketing. Practices: transportation, facilities (reduce, replace, re-use, recycle), services (types, activities and code of ethics), eco-labeling and green-washing, case studies of ecotourism in practice: best practice guidance, certification etc. Use of different media in publicity namely: newspaper, bulleting, radio and television; meeting with different interest groups in the country i.e. cooperative society; churches and student organization; workshops; seminars and public lectures. Methods and techniques of information generation and analysis in ecotourism publicity and marketing. Factors affecting market fluctuation.

EWM 755: Research Methods and Statistics (3 Units)
Introduction to nature of scientific enquiry, concepts of causation, literature review and the research question; use of the library and the internet for literature search. Conceptualisation and measurement; data collection instruments, validity, research study designs, threats to validity; selection of study subjects and size. Planning for data collection , management and analysis. Research ethics; research project management; the research proposal; characteristics of empirical research, the analysis of data graphically and statistically. Interpretation of research results, report writing and presentation. Evaluation of research performance.

EWM 756: Advanced Wildlife Ecology (3 Units) Concepts of ecosystem, natural communities and population ecology, population dynamics, ecological density. Parameters affecting population density; Natality rate - nutrition, age structure, environmental factors. Population interaction such as predator-prey interactions

EWM 757: Ecotourism Event Management (3 Units)
What is ecotourism event? Aims of ecotourism event, importance of ecotourism events in meeting the goals of ecotourism in protected areas, ecotourism events types, measuring values of ecotourism and event, uses of ecotourism events as interpretive and social marketing tools, ecotourism event themes and models, planning and staging ecotourism events, conceptualizing ecotourism events, guidelines for planning and staging ecotourism events.

EWM 758: Natural Resources Conservation (3 Units)
Foundational theory of community-based natural resources management, history, empirical evidence of community-based management of forest, wildlife and water resources globally. Case studies on community governance and market-based initiatives. Principles of community-based ecotourism, community based-ecotourism management, monitoring the success and impacts of community-based ecotourism, case studies of successful community-based ecotourism projects, challenges and opportunities for local participation

EWM 759: Rainforest and Savanna (3 Units)
The terrestrial ecosystems of Nigeria; distribution and function. The structure and dynamism of rainforest ecosystem of Nigeria. The savannas as a major biogeographic region:

Savanna woodlands, Savanna parklands, Savanna grasslands, Low tree and shrub savannas, Thicket and scrubs, Land use in forest and savanna environment. Distribution of wild herbivores within the forests and savannas.

EWM 760: Conflict Resolution in Wildlife and Ecotourism Management (3 Units)
Definition, history, global trend, typology, causes, consequences for humans and wildlife conservation, human-wildlife conflict management, decisional framework. Foundational theory of community-based natural resources management, history, empirical evidence of community-based management of forest, wildlife and water resources globally. Case studies on community governance and market-based initiatives.

EWM 761: Field Trip (2 Units)
Students will be expected to undergo a week training which involves participation and exposure to ecotourism and wildlife industries and parks in various parts of the country. Evaluation of technical reports submitted by the students at the end of trip will be carried out. The reports would be assessed and graded.

EWM 799: PGD Research Project (6 Units)
Supervised study on an identified problem requiring both oral and written presentation. Students must attend tutorial on research techniques and scientific writing as well as oral presentation relating to student's project in School. Students will be graded from the assessment of the Project Supervisor, the External Examiner's Assessment and oral presentation before the Panel of Examiners. The students are mandated to submit four bound copies of the dissertation after the External Examiner's Assessment.

M. TECH ECOTOURISM AND WILDLIFE MANAGEMENT

EWM 800: Seminar (2 Units)
Students will be expected to carry out literature review on recent developments in an area of current interests in the field of Ecotourism and Wildlife Management. The area of the review should not be directly related to the student's research project. An oral presentation of the review will be presented at an organized departmental seminar. The review must be typed, bound and submitted to the department for assessment.

EWM 801: Statistics (3 Units)
Basic parameters and non-parametric statistics, analysis of variance and its application in various experimental designs, correlation and regression analysis, analysis of co-variance.

EWM 802: Research Techniques in Ecotourism and Wildlife Management (2 Units)
Introduction to research, philosophy of research, research strategy: qualitative research methodologies which include the nature of qualitative research, selecting participants, evaluating qualitative research, interviewing in qualitative research, focus groups, observation and ethnography, case studies, projective techniques, and documents in qualitative research. Quantitative research methodologies which include the nature of quantitative research, measurement issues, reliability and validity, sampling, survey design and administration, and conducting experiments. Data entry and coding. Methods in ecology and field research. Use of SPSS and other computer-based data analysis software, interpretations of results.

EWM 803: Habitat Management (2 Units)
Terrestrial, aquatic and managed ecosystems. Concepts of biological diversity; properties and values of biological diversity, biological diversity and ecosystem integrity; managing biodiversity. Assessing, conserving and monitoring of biological diversity. The animal environment, space edges, design of edges. Habitat requirements; distribution, home range, ecological niche. Describing habitat requirements. Evidence of historical changes in habitat and associated animal populations. Field methods in habitat determination; Analysis and comparison of activity, time and place, Associating different habitat elements with differences in amount of use. Animal's response as a measure of the suitability of animal habitat. Agricultural land management for biodiversity conservation. Integrated biodiversity conservation for sustainable development.

EWM 804: Ecotourism and Wildlife Law, Policy and Administration (2 Units)
Introduction to legal framework of ecotourism and wildlife management in Nigeria, political context of wildlife management, endangered species act, natural resources laws and policies, with focus on Federal and State policies, water law and national environmental policy. Policy and legislation on protected areas, Community rights to natural resources, Local advisory committee in protected areas management.

EWM 805: Wildlife Ecology (2 Units)
Wildlife in relation to their environment. Concept of ecosystem and natural communities. Plants and animal interaction. Food and food habits. Ecology of some selected mammals (Proboscidae-African elephant- Perrisodactyla (Rhinoceros), Artiodactyla (Hippopotamidae and Bovidae (Hippopotamus and Bufallo), Canivora (Lion) and Primata (Gorilla,Chimpanzees and Monkeys. Predator-Prey interactions. Wildlife and Human interactions. Restoration Ecology.

EWM 806: Wildlife Extension, Communication and Community Development (2 Units)
Practice of planning from a community perspective. Techniques for community visioning, goal setting and master planning. Using regulations to guide conservation. Advocacy roles of "citizen," "reformer," and "organizer." Designing curricula and memoranda of understanding (MoUs). Conflict resolution. Designing an extension programme. Participatory rural appraisal exercises. Principles and processes of communication; types of communication. Developing

communication strategies. Principles of community development, social, cultural and gender issues. Action planning process, networking and linkage. Case studies.

EWM 807: Animal Capture Techniques (2 Units)
Principles of physical and chemical immobilization. Basic pharmacology of immobilising drugs. Types and safe usage of wildlife capture equipment. Principles of safe handling of mammalian, avian and reptile species. Anesthesiology of wildlife species. Handling and care of wildlife species under physical and chemical immobilization. Problems associated with animal capture, sample taking and data collection. Mass capture techniques. Transportation. Management of released wild animals. Occupational health, practical training in approaching dangerous animals.

EWM 809: Field Trip (2 Units)
Students will carry out field trip to areas of Wildlife and Ecotourism establishments for not less than 7 days. Report will be type written, bound and submitted to the department for grading.

EWM 810: Zoo and Museum Management (2 Units)
Zoo and museum management, biology of special groups of animals often kept in captivity like primates, big cats, canids, large birds, or reptiles. Basic concepts and techniques of animal handling, practical management skills required, policies and regulations that affect the operations of zoos. Theory and practice in museums management, educational roles of museums, collection and management policies and procedures, fundamental principles of exhibit design, production and maintenance.

EWM 811: Range Ecology and Management (2 Units)
Identification and classification of African rangelands with particular emphasis on West and East Africa. The savannas as a major biogeographic region: Savanna woodlands, Savanna parklands, Savanna grasslands, Low tree and shrub savannas, Thicket and scrubs, Land use in the savannas. Distribution of wild herbivores in the savannas. Animal-plant interactions in rangelands: Animal units and exchange ratios among different herbivores. Habitat and food selection/preference, Ecological separation and Livestock/wildlife grazing interactions. Management of some selected important Nigerian range plants and animals. Management of grazing systems and the role of fire and water spreading in range and pasture improvement. Shelter belt forestation and desertification control measures. The Nigerian major range management problems and identified preferred solutions. User rangeland resources and importance of rangeland in Nigerian economy. Producing management plans and feasibility studies for grazing reserves.

EWM 812: Conservation Genetics (2 Units)
The application of conservation genetics in biodiversity management. Study design and sampling consideration in conservation genetics. Sampling collection and storage. Introduction to Microsatellite; genetic diversity; calculate level of genetic diversity. Hardy Weinberg as foundation for population genetics. Genetic drift and differentiation, assignment test, hybridization, wildlife forensic. Demographic estimation from microsatellite, DNA sequences. Demographic estimation from DNA sequence data. Phylogenetics.

EWM 813: Population Ecology (2 Units)
The concept of population; Population density, Types of population density, Crude density, Ecological density. Parameters affecting population density; Natality rate - nutrition, age structure, environmental factors. Mortality rate - predation, disease and parasites, weather. Immigration. Emigration. Life tables, Mortality curves, Survivorship curves. Population structure, Age composition, Age pyramids, Sex composition, Sex pyramids. Population distribution, Types of distribution. Factors influencing population dispersal. Intrinsic factors - competition, disease and pests, food supply, parasitism, predation, behavioral, Extrinsic factors - weather, topography, latitude, edaphic. Population growth model. Population fluctuations and cycles, key factor analysis.

EWM 814: Remote Sensing and GIS (2 Units)
Remote sensing, biophysical consideration, the aerial camera and film filter combination, geometrical characteristics of aerial photographs, thermal scanning, SLAR; remote sensing by satellites; application to forest resources management, application of geographical information systems in environmental management.

EWM 815: Wetlands and Avian Conservation (2 Units)
The abundance, structure, and function of wetland ecosystems in Nigeria. Wetland ecological principles and its application to conservation, restoration, and management of wetlands and wetland dependent organisms. Adaptation of biological organisms to the wetland environment. Principles of conservation and management of birds. Avian conservation and management issues across Africa. Critical area for conservation of birds in Nigeria. Important Bird Areas in Nigeria. Endangered and threatened bird species of Nigeria. Strategies for conservation of endangered bird species in Nigeria. The concepts, theories, and ideas related to the conservation and management of threatened and endangered bird populations, and their habitats. Environmental, ecological and ecotourism functions of avian. General patterns of bird migration. The importance of protection of stopover points for the conservation of migratory birds and ecotourism development.

EWM 816: Natural Resource Economics and Enterprise Development (2 Units)
Overview of basic economic principles and their application in wildlife and ecotourism industry, concepts of dynamic optimization of harvest and depletion rates, wildlife policy and multi-species modeling, economic collective decisions. Overview of biodiversity business development, key

opportunities and challenges, biodiversity business success factors, types of biodiversity business, steps to enterprise development.

EWM 817: Conservation Biogeography (2 Units)
Biogeographical principles, theories, and analyses. The distributional dynamics of taxa individually and collectively. Problems of biodiversity conservation. Social values and conservation biogeography. Biogeographical barriers such as mountains, rivers, forest formations and discontinuity in forest spread. Protected area planning frameworks - mapping present and future biogeographical regions. Major biogeographical barriers in Africa.

EWM 818: Game Ranching, Domestication and Crocodile Farming (2 Units)
Background to wildlife farming and ranching, principles and guidelines; laws and regulations governing wildlife farming and ranching in Nigeria and their enforcement; types and purposes of farms; critical issues in wildlife farming; diseases and parasites on a farms; species of interest for wildlife farming; management of a wildlife farm. Types of ranches; planning a wildlife ranch: types of animals to be ranched, ecological capacity, designing a stocking program, infrastructure and equipment; salt lick distribution, harvesting technique. Marketing of farm and ranch products; record keeping.

EWM 819: Protected Area Planning and Management (2 Units)
Categories of protected areas , steps in planning, conditions necessary for planning, types and level of planning, park planning processes, planning team, phases in park planning process(pre design, design, development and actualization), land use in protected areas, zoning buffer , core and regional influence zone.

EWM 820: Community Participation in Renewable Resource Management (2 Units)
Definition of community and participation, types of community, forms/typology and benefits of participation, ladder of Participation, what to avoid in participation, stakeholder's analysis. Who are stakeholders? Identifying stakeholders, linkages between stakeholders and different types of participation, participation tools, success factors of participatory method, gender issues in participation, Case studies on community participation from East Africa, the Pacific and South east Asia.

EWM 821: Environmental Survey and Data Indices Production (2 Units)
Concept of environmental survey (bio-physical and bio-chemical components). Visual survey (reconnaissance) (Purpose, location, habitat parameters, geology, meteorology), Surveying methods; Leveling and Topographic survey – Location, Accessibility, Communication, Power supply,- Land status. Topographic maps and plans. Index or location map, Boundary map, Contour map, Cross and longitudinal section and Land map General Information and data needed for topographic survey; Hydrological data, Meteorological data, Water Source and quality, Principles of dynamics of vegetation.. Environmental factors, their interrelationships and influence on plant growth, development and animal distribution

EWM 822: Ecotoxicology and Waste Management (2 Units)
Principles of environmental toxicology, environmental pollution and control, waste management, types of waste (domestic, municipal and industrial) waste disposal, techniques for minimizing waste generation, waste treatment and processing.

EWM 823: Land Use Planning for Conservation (2 Units)
Definition of soil; Soil components; Important soil properties; Soil profiles. Soil formation and classification. Soil catena and its relationship to vegetation and land use. Land surveying; Chain and compass survey, Distance measurement (pace factor), What is land use planning? When is land use planning useful? Focus on land use planning, Planning at different levels, Land use planning steps. Land evaluation; Land evaluation systems, Land qualities and characteristics for different land uses, Land use requirements, Preparation of land capability/suitability maps, Standard format of land evaluation reports, Preparation of a land use plan, Preparation of a participatory land use plan. Land use planning in protected areas, Biodiversity values and selection of protected areas, Assessing potentials, Land use zones within protected areas, Core zones, Buffer zones, Transition zones. Land use conflicts; Definition of land use conflict, Causes of land use conflict and Resolving land use conflicts

EWM 824: Management of Endangered Species (2 Units)
Biodiversity and drivers of species decline; conservation planning and priority setting; Causes of rarity; remedial measure against rarity; translocation of rare species; Principles and methods of reintroduction. The role of zoos and captive breeding; principles of animal husbandry; conservation medicine and wildlife disease; small population biology and genetics; in-situ conservation techniques; management and leadership skills; facilitation and team skills; GIS for conservation managers; captive and field research skills and education and community conservation.

EWM 826: Environmental Impacts Assessment and Auditing (2 Units)
Basic concepts and history of environmental relationship assessment (EIA). Relationship between Environmental Impact Assessment (EIA) and Environment Impact Statement (EIS). Essentials steps in EIA. Potential problems of EIA and proffered solutions. Cost benefit analysis as a tool for environment decision-making procedure for monitoring, auditing and preparation of environmental management programme.

EWM 830: Wildlife Diseases and Parasitology (2 Units)
Diseases of wildlife with emphasis on causes and mechanisms of disease, pathobiology of disease, and epidemiology and population significance of disease. Broad categories of wildlife diseases with an emphasis on the evolutionary strategies of viruses, bacteria and parasites. Implication for management and conservation strategies. Major parasites of wildlife species, parasitic life cycles on nematodes, cestodes, trematodes, blood protozoans, and ecoparasites. Emphasis on those common parasites which cause diseases in wildlife and/or are of major zoonotic importance.

EWM 831: Advanced Wild Animal Nutrition (2 Units)
Principles of nutrition of wild animal species; Classification of nutrient sources and composition of wild animal food. Studies on dietary requirements of wild animal species in the tropic especially protein, amino acids, energy partitions, lipid, vitamins and minerals. Characteristics, availability, limitation and utilization of food and feedstuffs. Anti-nutritional factors in feedstuffs. Digestibility and metabolic processes. Assessment of growth performance and feed utilization in wild animal species.

EWM 832: Wildlife Physiology and Adaptation(2 Units)
Homeostatic control of body sugar, carbondioxide, temperature, water. Physiology of food digestion, metabolism, reproduction. Fecundity/prolificacy of animals. physiological basis for migration. Role of different organs of animals eg liver, kidney, alimentary canal, blood system, hormonal functions. Adaptation for feeding, predators, prey, self-defense and protection. Nutrient requirements, grooming, socialization. Morphological features such as sharp claws, sharp teeth, strong and sharp beak, webbed feet, wings, hooves. Morphological shapes and adaptive features of different species of animals in their habitats.

EWM 833: Feed Formulation Technology (2 Units)
Concepts of alternative feed ingredients. Classification of foods and feedstuffs, selection and biochemical assessment of wild animal feedstuffs. Use of low cost ingredients in wild animal nutrition. Feed ingredients and feed formulation for various animal species in captivity. Fundamental feed analysis and concept of feeding standards. Principles of feed formulation overview of feed establish. Safety regulations pertaining to feed formulation.

EWM 834: Minilivestock Production (2 Units)
Techniques of feeding animals in captive setting. Hazards of animal domestication. Importance of feed supplementation and use of artificial diets in dry seasons. Nutrient requirements of the following grasscutter, giant rat, guinea fowl and snail. Studies on the nutrient composition of animal natural foods. Basic techniques in animal feed formulation for minilivestock. Techniques for both large and small rearing of minilivestock Encouragement of backyard farming in both rural and urban areas. Post-harvest techniques of minilivestock products, processing and marketing.

EWM 835: Wild Animal Resources and Utilization (2 Units)
Systems perspective of wild animals' resources and their management problems, basic and values of wildlife in national economy. Studies of basic and practical values of wild. Handling, processing, preservation and marketing of wildlife and it's by-products. Social acceptability of wildlife products. Usefulness of wild animal and its by-products in various industries.

EWM 836: Apiculture (2 Units)
Locating appropriate site for honey farming, Identifying suitable conditions, for honey farming, Beehive construction, types of wood required and the size of the hives, detection of appropriate time to harvest materials needed for the operation , harvesting techniques, uses of honey products, assessment of honey quality , processing honey for different uses.

EWM 840: Recreation Ecology (2 Units)
What is park/recreation ecology, significance and implication, types of impact, factor/degree of impact: resistance and resilience, pattern of impact: spatial and temporal impact patterns, impact management, multidisplinary nature of park recreation ecology (holistic approach), impact monitoring: social and biological monitoring methods, impact management: visitor and site management strategies, invasive species management, research trends and future research in park recreation ecology.

EWM 841: Ecotourism and Recreational Planning (2 Units)
Review of current tourist industry operations and practices, organization, management and structure of the tourism industry. Introduction to ecotourism, niche for ecotourism today. Ecotourism planning, marketing and management. Ecotourism and community development. Ecotourism's implications for sustainable development and environmental conservation. Management issues pertaining to the establishment and operations of a travel agency, travel agency licensing, IATA accreditation and financial management issues.

EWM 842: Cultural Heritage Conservation (2 Units)
The roles of culture in nature conservation, Indigenous knowledge, traditional practice, norms and belief on conservation, stories, taboos, riddles, slogans, tales poetry, commentaries, proverbs, sayings, and songs to teach conservation, integrating indigenous conservation methods in conservation, local conservation areas, sacred grooves, shrines, restricted areas, Environmental education and cultural awareness, methods of disseminating conservation education, education for sustainability, formation of environmental conservation clubs, eco clubs, green clubs, local community groups, cultural heritage tourism, intangible and tangible heritage resources, cultural heritage tourism, creative industries and local enterprise , archeological , historic and monuments sites management.

EWM 843: Park and Environmental Interpretation (2 Units)

Principles of park interpretation: aims; purpose; benefits; differences between interpretation information and instruction; reasons for interpretation; benefits of interpretation; principles of interpretation; types of audience; setting, Interpretive media, planning interpretation to meet the needs of different visitor types; consideration of relevance to setting; selection of appropriate media; consideration of accessibility; planning guided and self-guided interpretive activities; script/talk/story board planning; planning walks/trails, planning interpretive media (content, location and layout); planning themes and making interpretation interesting, relevant, enjoyable and organised; management requirements use of themed interpretation; design considerations for printed interpretation, planning talks and tours.

EWM 844: Ecolodge Management and Sustainable Tourism Development (3 Units)

Ecolodge principle and criteria, types of ecolodge, management of ecolodge, community involvement in ecolodge management, impacts of ecolodge, Designs and operations of ecolodge, visitors management. Nature and scope of sustainable tourism, Carrying capacity, Community participation in ecotourism development, types of sustainable tourism, social and economic impacts of sustainable tourism, various approaches to sustainable tourism management. Local stakeholder involvement in community based ecotourism, stakeholder analysis. Principles of community-based ecotourism, monitoring the success and impacts of community-based ecotourism, case studies of successful community-based ecotourism projects, challenges and opportunities for local participation.

EWM 845: Advanced Ecotourism Marketing and Publicity (2 Units)

What is tourism/ecotourism marketing, Importance of marketing, the marketing process, designing customer driven marketing strategy, social marketing concept. Marketing management philosophies, marketing plans, characteristic of service marketing, management strategies for service business, role of marketing in strategic planning, the marketing information system, Marketing research, market segmentation, Targeting and positioning, designing and managing products. Policy as marketing tools- considerations approaches and strategies, distribution channels, promoting products communication, promotion policy and adverstising, public relations, marketing public relations, public relation process, sales promotion.

EWM 899: Master's Thesis Research Project (12 Units)

Student will carry out a research project under the supervision of one or more members of academic staff. The research, of which outcome should contribute to knowledge, could be investigative, basic or applied and would in most cases, be directed at solving an identified problem related to wildlife or Environmental Ecology. The student will be expected to make an oral presentation in departmental seminars of the project plan and/or its progress before or during the investigation and of the outcome at the completion of the research. The provision of a project supervisor notwithstanding, the student should be made to demonstrate independent initiative and motivation, as this will be considered in the project assessment. A final report of the project will be typed and bound in an approved format and the student will be expected to satisfy a panel of internal and external examiners at an oral examination.

EWM 999: Doctoral Research Project

Independent research on topics within the area of Wildlife Ecology, Production, Ecotourism and Biodiversity Conservation chosen in consultation with the student's supervisor. A thesis will be submitted on completion in partial fulfillment of the requirement for the award of Doctor of Philosophy (Ph.D.) degree.

LIST OF ACADEMIC STAFF

S/N	Names	Status	Specialisation	Email Address	PHONE NO.
1	Prof. A. A. Ogunjinmi	Professor	Wildlife and Ecotourism Extension and Management	aaogunjinmi@futa.edu.ng	08077428332
2	Prof. A. I. Adeyemo	Professor	Wildlife Nutrition	aiadeyemo@futa.edu.ng	08034746386
3	Prof. B. G. Ogunjemite	Professor	Primate Community Ecology	bgogunjemite@futa.edu.ng	08033893257
4	Prof. (Mrs.) B. N. Ejidike	Professor	Wildlife Nutrition	bnejidike@futa.edu.ng	08034704604
5	Prof. (Mrs.) O. O. Oyeleke	Professor	Protected areas Management and Ecotourism	oooyeleke@futa.edu.ng	08057038837
6	Prof. S. O. Oladeji	Professor	Ecotourism and Heritage Resource Conservation and Management	sooladeji@futa.edu.ng	08030698896
7	Dr. (Mrs.) B. O. Adetola	Reader	Heritage conservation and Ecotourism Management	boadetola@futa.edu.ng	08032261931
8	Dr. O. S. Odewumi	Reader	Wetland Resources and Avian Conservation	osodewumi@futa.edu.ng	08032206099
9	Dr. (Mrs.) F. C. Arowosafe	Reader	Ecotourism and Hospitality Management	fcarowosafe@futa.edu.ng	07066297952

9.1.6 DEPARTMENT OF FISHERIES AND AQUACULTURE TECHNOLOGY (FAT)

1. PROGRAMMES OFFERED

a) Postgraduate Diploma (PGD)
b) Masters of Agricultural Tech. (M. Agric. Tech.)
c) Doctor of Philosophy (Ph.D.)

2. AVAILABLE OPTIONS/ SPECIALIZATION

a) PGD with specialization in
   i) Fisheries Management
b) M. Agric. Tech. with specialization in
   i) Fisheries Management
   ii) Aquaculture
c) Ph.D. with specialization in
   i) Fisheries Management
   ii) Aquaculture
   iii) Fish Nutrition
   iv) Post Harvest Technology and Utilization

3. PHILOSOPHY AND OBJECTIVES

a) Philosophy of the Programme

The philosophy of the programme is to provide functional education for Postgraduate students who eventually after the training will become job makers and job creators who in addition will be trainers of top level academics and Masters of Industrial sector.

The Academic programme is well focused and tailored towards advancement of knowledge in Environmental Control and Management, Biodiversity Management, Fish Production, Utilization and Advanced aquacultures for food production and poverty alleviation.

b) Programme Objective

The major objectives of the programme are to:

i) provide advanced education and training in the science and technology of fisheries, resources, aquaculture, environmental impact assessment, biodiversity management to cater for the Higher Management Requirements of the nation.
ii) provide functional education for Postgraduate students at Masters and Postgraduate diploma levels who will eventually become job makers and trainers of the captains of Industries and distinguished academics.
iii) provide opportunity for problem solving research studies focused on fish production and utilization and provision of the necessary raw materials for the national agricultural Industries in this sub sector.
iv) offer to the public the results of research break-through and foster the practical application of these results.
v) provide advanced studies and higher training in environmental impact assessment, environmental control and management, management of national biodiversity, and industrial bionutrients production, for sustainable agriculture and poverty alleviation especially in rural areas.

4. ADMISSION REQUIREMENTS

Candidates seeking admission for doctor of Philosophy (Ph.D.) must have obtained 60% or 3.50 CGPA weighted averaged mark in the Master's degree programme in any recognized university and show satisfactory potential for research work.

To qualify for admission into a Masters Programme, candidate shall normally possess a good Bachelor's degree from this University or any other University recognized by the senate of FUTA; at second-class upper or lower division, candidates with good honour degrees in fisheries, wildlife or fisheries and wildlife combined or botany zoology. Biology or other related subjects are eligible; where necessary the Department will prescribe additional required courses for any candidate having deficiencies.

Candidates for Postgraduate diploma courses shall normally posses B. Sc. Degree Honours not less than a third class in relevant biological or agricultural courses, HND holders with upper or lower credit are also eligible.

5. DURATION OF THE PROGRAMME

a) PGD

The academic programme, which will be on a part-time basis, includes a course work and a supervised research project and both will cover a minimum period of three (3) semesters.

b) M. Agric. Tech. Full-time: 18 months

c) Ph.D.
Full –time: 36 months
Part-time : 48 months

(On application, candidates may be granted extension on programme duration subject to approval of senate).

6. REQUIREMENT FOR GRADUATION

a) PGD

To be eligible for the award of PGD, a candidate must have passed 36 units of course work, including 6 units of research Project.

b) M. Agric. Tech.

M. Agric. Tech. in the area of specialization is awarded to a candidate who has:

i) accumulated a TLU of 36 including 12 units of Thesis Research, 18 units of 6 compulsory or core courses and 6 units of Electives;
ii) successfully presented a minimum of two (2) Departmental Research project Seminars;
iii) Successfully defended the Research Thesis in the specialized area at an oral examination organized by the School of Postgraduate Studies (SPGS).

c) Ph.D.

A candidate is awarded a Ph.D. degree after he has successfully

i) completed any prescribed course work;
ii) presented three (3) Departmental Research project Seminars;
iii) defended the Research Thesis in a specialized area at an oral examination organized by the School of Postgraduate Studies (SPGS).

7. COURSE OUTLINE

(a) PGD

FIRST SEMESTER

Course Code	Course Title	T	L	P	Units
FAT 751	Aquaculture Production and Management	0	3	0	3
FAT 753	Water Quality and Aquatic Production	3	0	0	3
FAT 755	Research Methods and Statistics	3	0	0	3
FAT 757	Shrimp/Prawn Culture	3	0	0	3
FAT 759	Fish Parasitology and Pathology	3	0	0	3
	TOTAL	**12**	**3**	0	**15**

SECOND SEMESTER

Course Code	Course Title	T	L	P	Units
FAT 750	Seminar	0	2	0	2
FAT 752	Fisheries Extension & Education	0	2	0	2
FAT 754	Fish Breeding and Biotechnology	0	3	0	3
FAT 756	Fish Nutrition and feed Technology	0	3	0	3
FAT 758	Post Harvest Technology	0	3	0	3
FAT 760	Fish Marketing and Cooperatives	0	3	0	3
	TOTAL	**0**	**16**	**0**	**16**

THIRD SEMESTER

Course Code	Course Title	T	L	P	Units
FWL 799	PGD Research Project	0	0	0	6
	TOTAL	**0**	**0**	**0**	**6**

b) M.TECH

(i) Aquaculture Option

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
FAT 801	Statistics and Experiment designs	3	0	0	3
FAT 803	Advanced Fish Breeding Technology	2	0	3	2
FAT 805	Advanced Fish Biology	2	0	0	2
FAT 807	Water Quality assessment	2	0	0	2
FAT 809	Aquaculture Planning & Feasibility Studies	2	0	0	2
FAT 811	Advanced Shell Fish Biology and Production	2	0	0	2
	Electives				4
	TOTAL	**13**	**0**	**3**	**17**

Electives

Course Code	Course Title	L	T	P	Units
FAT 825	Fisheries Extension and Education	2	0	0	2
FAT 827	Advanced Cage Culture Systems	**2**	**0**	**0**	**2**

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
FAT 800	Seminar	2	0	0	2
FAT 802	Advanced Fish Nutrition	2	0	0	2
FAT 804	Fish Pathology and Parasites	2	0	0	2
FAT 806	Advanced Fish Post Harvest Technology	2	0	0	2
FAT 808	Water Chemistry and Pollution	2	0	0	2
FAT 810	Fish Marketing and Cooperatives	2	0	0	2
	TOTAL	**12**	**0**	**0**	**12**

Electives

Course Code	Course Title	L	T	P	Units
FAT 816	Production & Marketing of Other Marine Products	2	1	0	3
FAT 818	Advanced Larval Food Production	2	0	3	2

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
FAT 899	Master's Thesis Research Project	0	0	0	12

(ii) Fisheries Management Option
FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
FAT 801	Statistics and Experimental Designs	3	0	0	3
FAT 805	Advanced Fish Biology	2	0	0	2
FAT 813	Environmental Impact Assessment and Pollution	2	0	0	2
FAT 815	Fisheries Development and Management	2	0	0	2
FAT 817	Oceanography and Water Quality Assessment	2	0	0	2
FAT 821	Marine Resources and Utilization	2	0	0	2
	Electives				4
	TOTAL	**13**	**0**	**0**	**17**

Electiv es

Course Code	Course Title	L	T	P	Units
FAT 811	Advanced Shellfish Biology & Production	2	0	0	2
FAT 823	Ecosystem Modeling	2	0	0	2
FAT 825	Fisheries Extension and Education	2	0	0	2
	TOTAL	6	0	0	6

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
FAT 800	Seminar	0	2	0	2
FAT 804	Fish Pathology and Parasites	2	0	0	2
FAT 806	Advanced Fish Post Harvest Technology	2	0	0	2
FAT 810	Fish Marketing and Cooperatives	2	0	0	2
FAT 812	Fisheries Policy and Administration	2	0	0	2
FAT 814	Fish Stock Assessment & Pollution Dynamics	2	0	0	2
FAT 820	Ornamental & Recreational Fisheries	2	0	3	2
	TOTAL	**12**	**2**	**0**	**14**

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
FAT 899	Master's Thesis Research Project	0	0	0	12

(c) PhD

Course Code	Course Title
FAT 999	Doctoral Research Project

9. COURSE SYNOPSES (POSTGRADUATE DIPLOMA IN FISHERIES MANAGEMENT AND AQUACULTURE)

FAT 750: Seminar (2-Units)
Students will be expected to carry out literature review on recent developments in an area of current interests in the field of Aquaculture. The area of the review should not be directly related to the student's research project. An oral presentation of the review will be presented at an organized departmental seminar. The review must be typed, bound and submitted to the department for assessment.

FAT 751: Aquaculture Production and Management (3-Unit s)
Aims and types of aquaculture, principles of fish stocking, lining, pond fertilization, feeding, weed control, fish harvesting, water quality requirements, species selection and artificial propagation, pond maintenance.

FAT 752: Fisheries Extension and Education (2-Units)
Principles and methods of extension programmes, extension need in aquaculture and fisheries management, interpretation and dissemination of research findings, organizing associations and cooperatives, methods of evaluation and methods of information dissemination.

FAT 753: Water Quality and Aquatic Production (3-Units)
Physical and chemical composition of water bodies, nutrient cycles and aquatic productivity, sampling methods and analyses, pollution and impacts on water bodies and aquatic organisms, Methods of water quality assessment and improvement.

FAT 754: Fish Breeding and Biotechnology (3 – Units)
Principles of fish breeding, selection of brooders, induced spawning, types of artificial propagation and methods, incubation and hatching of fish eggs, rearing of hatchlings, fry and fingerlings, use and types of natural food, maintenance and management of techniques of indoor and outdoor hatcheries, sales and economics of fish seed production.

FAT 755: Research Methods and Statistics (3-Units) Research techniques, data collection and representation, frequency distribution, line diagram, bar diagram, histogram and relative frequency, histogram, pie charts and cumulative frequency distribution, measures of central tendency, sampling techniques, bionomical and normal distribution, correlation and regression, analysis of variance and applications.

FAT 756: Fish Nutrition and Feed Technology (3-Units)
Rudiments and principles of fish nutrition, classification of foods and feed-stuffs, biochemical assessment of fish feed-stuffs and selection, use of low-cost ingredients in fish nutrition.

FAT 757: Shrimp / Prawn Culture (3-Units)
Identification and classification of marine and freshwater shell fishes, Culture of tropical prawn and shrimp, Production of bivalves and pearl oyster, Water quality and toxicity, Nutrition, disease and genetics of freshwater crustacean.

FAT 758: Post Harvest Technology (3-Units)
The structure and principal components of fish muscles, and factors affecting their composition, major causes of fish spoilage, physical and chemical changes after rigor mortis, fish preservation and processing, fish quality assessment, organoleptic measurement and international standards for fisheries products.

FAT 759: Fish Parasitology and Pathology (3-Units) Identification, morphology, taxonomy, life history of prevalent parasites and their effects on fish population common bacterial, fungal and final fish diseases and their control. Preservation of feedstuffs and factors affecting feedstuffs quality, nutrient requirements for fish, (herbivorous and carnivorous spp).

FAT 760: Fish Marketing and Cooperatives (3-Units) Principles and importance of marketing, market structures and functions, marketing agencies, channels of distribution, promotional activities, factors affecting marketing of fisheries products, origin and principles of cooperative, types and functions of cooperative societies, methods of disbursement of dividends, factors affecting the growth of cooperative societies.

FAT 799: PGD Research Project (6-Units)
Supervised study on identified problems requiring both oral and written presentation. Students must attend tutorials on research techniques and scientific writings as well as oral presentation relating to students' projects in the schools. The projects must be based on use of locally available raw materials to solve problems facing wildlife production in Nigeria.

M. TECH. IN AQUACULTURE
FAT 800: Seminar (2-Units)
Students will be expected to carry out literature review on recent developments in an area of current interests in the field of Aquaculture. The area of the review should not be directly related to the student's research project. An oral presentation of the review will be presented at an organized departmental seminar. The review must be typed, bound and submitted to the department for assessment.

FAT 801: Statistics and Experimental Design (3-Units)
Basic parameters and non-parametric statistics; analysis of variance and its application in various experimental designs, correlation and regression analysis, analysis of co-variance.

FAT 802: Advanced Fish Nutrition (2-Units)
Studies on dietary requirements of fish species (Tropical and Temperate fish species) especially; proteins, amino acids, energy partitions, lipid vitamins and minerals. Feedstuffs and ingredients, their sources, characteristics, availability, limitation and utilization in fish feed. Anti-nutritional factors in feedstuffs and ingredients. Various methods of processing fish feed and feed formulation techniques. Assessment of growth performance and feed utilization in fish.

FAT 803: Advanced Fish Breeding Technology(2-Units)
Fish seeds in aquaculture. Selecting fish species for fish breeding. Hatchery system design, infrastructure and organization. Broodstock management. Hormonal treatment of fish. Egg incubation and hatching. Technology of larval and early fry rearing, as well as production of live foods. Common problems in fish seed production and their management. Transport of fish seeds and broodstock. Cryopreservation and genetic manipulation in fishes.

FAT 804: Fish Pathology and Parasites (2-Units) Types of diseases, infectious and contagious disease, factors, vomits, viruses, bacteria, fungi, protozoa recognition of diseases, species specific diseases, effects of disease, control of diseases, general health principles, external and internal structures of fish, their function and importance, immunity and defense in fish.

FAT 805: Advanced Fish Biology (2-Units)
Morphology and anatomy of typical bony and cartilaginous fishes, fish physiology and reproduction, embryology and fecundity studies, age and growth functions, condition factors, length-weight relationships and frequency of distribution, digestive enzyme studies, assay methods.

FAT 806: Advanced Fish Post Harvest Technology (2-Units)
Review of structure of fish muscle. Biochemical composition of fish muscle and factors affecting them. Causes of fish spoilage. Post mortem changes in fish. Processing and preservation techniques of fish. Physical, chemical, laboratory, microbiological and sensory evaluation techniques of assessing fish spoilage and storage length. Quality control, guidelines and standardization of fish products.

FAT 807: Water Quality Assessment (2-Units)
Ocean current, characteristics, similarities with atmospheric circulation, upwelling and fish production global warming, ocean water stratification, seasonal theromocline, ocean convection, vertical currents, pollution, temperature and salinity measurement, relevance of oceanographic forecasting to the fishermen and fisheries management.

FAT 808: Water Chemistry and Pollution (2-Units)
Water chemistry and pollution studies, distribution, movement and production of planktons, physical properties of water.

FAT 809 : Aquaculture Planning And Feasibility Studies (2-Units)
Land survey, clearing and excavation, soil tests, water tests, farm site/location, effluent management Economics of production and feasibility studies.

FAT 810: Fish Marketing and Cooperatives (2-Units)
Marketing – General theories of market and classification. Supply factors affecting fish supply, price determination. Marketing function and services. Cooperative – formation, goals and functions of fishermen cooperative, factors influencing size, role of cooperative in fisheries economy and government's role.

FAT 821 : Marine Resources and Utilizations (2 - Units)
Current status of Marine resource biodiversity. Marine Ecosystem diversity and characterization, Ecological niches, habitat profile. Exploitation strategies. Deep sea and shore farming of some products. Utilization and marketing of marine products.

FAT 825: Fisheries Extension and Education Principles and methods of programme planning, extension in fisheries, use of mass methods, group methods, demonstration and individual methods and their merits and demerits, organization of associations. Concept of evaluation applied to fisheries extension and dissemination of research findings to feed workers.

FAT 816: Production and Marketing of Other Marine Products (3-Units)
Ecology-life histories and distribution of other marine products – Mollusk, marine gastropods, edible sea weeds, reptiles, and other invertebrates. Production, harvesting techniques, utilization and marketing. Contribution to the national economy and channels of distribution.

FAT 818: Advance Larval Food Production (2-Units)
larval cultivation of fin fish and shellfish and the necessity to produce live food production methods and environmental conditions for cultivating marine and freshwater finfish and shellfish larval. Principles and practices of larval food production; plankton aquaculture - *Chlorophycota, Bacillarioppyta, Cyanophycota, Rhodophyta Chrysophta*. Rotifer, copepods and micro algae culture parameters, production level reliability. Cost reduction and ongoing development on commercial-scale production of live feeds for larvae of finfish and shellfish. Preparation, culture and feeding of micro algae, rotifers and brine shrimp artemia.

FAT 827: Advanced Cage Culture System (2-Units)
Marine aquaculture, cage culture systems, selection of species for cage culture, types of cage, construction, effects of construction materials on the water environment, effects of cage culture in practices in the water environment and aquatic biodiversity.

FAT 899: Master's Thesis Research Project (12 Units)
Students will carry out a research project under the supervision of one or more members of academic staff. The research of which outcome should contribute to knowledge, could be investigative, basic or applied and would in most cases, be directed at solving an identified problem related to fisheries or Environmental Ecology. The student will be expected to make an oral presentation in departmental seminars of the project plan and/or its progress before or during the investigation and of the outcome at the completion of the research. The provision of a project supervisor notwithstanding, the student should be made to demonstrate independent initiative and motivation, as this will be considered in the project assessment. A final report of the project will be typed and bound in an approved format and the student will be expected to satisfy a panel of internal and external examiners at an oral examination.

M. TECH. IN FISHERIES MANAGEMENT
FAT 800: SEMINAR (2-UNITS)
Students will be expected to carry out literature review on recent developments in an area of current interests in the field of Aquaculture. The area of the review should not be directly related to the student's research project. An oral presentation of the review will be presented at an organized departmental seminar. The review must be typed, bound and submitted to the department for assessment.

FAT 801: Statistics and Experimental Designs(3-Units)
Basic parameters and non-parametric statistics, analysis of variance and its application in various experimental designs, correlation and regression analysis, analysis of co-variance.

FAT 804: Fish Pathology and Parasities (2-Units) Types of diseases, infectious and contagious disease, vectors, vomits, viruses, bacteria, fungi, protozoa recognition of diseases, species specific diseases, effects of disease, control of diseases, general health principles, external and internal structures of fish, their function and importance, immunity and defense in fish.

FAT 805: Advanced Fish Biology (2-Units)
Morphology and anatomy of typical bony and cartilaginous fishes, fish physiology and reproduction, embryology and fecundity studies, age and growth functions, condition factors,

length-weight relationships and frequency of distribution, digestive enzyme studies, assay methods.

FAT 806: Advanced Fish Post Harvest Technology (2-Units)
Review of structure of fish muscle. Biochemical composition of fish muscle and factors affecting them. Causes of fish spoilage. Post mortem changes in fish. Processing and preservation techniques of fish. Physical, chemical, laboratory, microbiological and sensory evaluation techniques of assessing fish spoilage and storage length. Quality control. Guidelines and standardization of fish products.

FAT 807: Water Quality Assessment (2-Units) Ocean currents, characteristics, similarities with atmospheric circulation, upwelling and fish production global warming, ocean water stratification, seasonal theromocline, ocean convection, vertical currents, pollution, temperature and salinity measurement, relevance of oceanographic forecasting to the fishermen and fisheries management.

FAT 810: Fish Marketing and Cooperatives (2-Units)
Marketing – General theories of market and classification. Supply factors affecting fish supply, price determination. Marketing function and services. Cooperative – formation, goals and functions of fishermen cooperative, factors influencing size, role of cooperatives in fisheries economy and government's role.

FAT 811: Advanced Shell Fish Biology and Production (2-Units)
Life histories and distribution of crustaceans Aquaculture techniques and culture of penaeid shrimps, freshwater Macrobrachium, marine and freshwater crabs. Production scales and farming systems level. Marketing, processing and utilization of portunid crabs, lobsters and crayfish. Crustacean health, pests and diseases. Channels of distribution.

FAT 812: Fisheries Policy and Administration (2-Units)
National laws on natural resources management, fisheries legislation, national and state policies on fisheries, administrative structures of fisheries in Nigeria, fisheries conservation efforts and problems in Nigeria, fisheries institutions, conservation strategies, international laws and laws of the sea.

FAT 813: Environmental Impact Assessment and Pollution (2-Units)
Water quality monitoring and control, setting of water quality standards , water sampled analysis, detection of causes of water degradation and fish mortality, diagnosis of cause of fish poisoning, hydrobiological examinations.

FAT 814: Fish Stock Assessment and Population Dynamics (2-Units)
The primary objectives of fish stock assessment, the stock concept, analytical, holistic models in fish stock assessment. Evaluation of fisheries resources in related aquatic environment fish population analysis. Attributes of population dynamics, such as growth, mortality, recruitment, age, sex, etc. different sampling techniques in fisheries.

FAT 815: Fisheries Development and Management (2-Units)
Basic and practical objectives of fisheries development and management; development and management of lakes, rivers, impacts of wetlands and mangrove ecosystems on fisheries production. The concept of maximum sustainable yield and production functions. Coral reefs ecology and influence on fish production.

FAT 818 : Advance Larval Food Production (2-Units)
Introduction to larval cultivation of fin fish and shellfish and the necessity to produce live food production methods and environmental conditions for cultivating marine and freshwater finfish and shellfish larval. Principles and practices of larval food production; plankton aquaculture – Chlorophycota ,Bacillarioppyta, Cyanophycota, Rhodophyta Chrysophta. Rotifer, copepods and micro algae culture parameters, production level reliability. Cost reduction and ongoing development on commercial-scale production of live feeds for larvae of finfish and shellfish. Preparation, culture and feeding of micro algae, rotifers and brine shrimp artemia.

FAT 820: Ornamental and Recreational Fisheries (2 Units)
Identification, management and nutrition of ornamental fishes; design, construction and maintenance of fountains, aquaria and ponds for ornamental fishes. Culture and breeding of aquarium fishes. Aquarium fish trade, sport fishing in recreation and tourism. Management techniques and daily routine operations in the culture of ornamental and recreation fisheries. Economic importance of ornamental and sport fishes, especially tropical fish species.

FAT 821: Marine Resources And Utilization (2-Units)
Current status of Marine resource biodiversity. Marine Ecosystem diversity and characterization, Ecological niches, habitat profile. Exploitation strategies. Deep sea and shore farming of some products. Utilization and marketing of marine products.

FAT 823: Ecosystem Modelling (2-Units)
Modeling water quality in marine ecosystems, characteristics of marine aquaculture systems, phytoplankton and heterotrophic processes, sediment water interactions, hydrodynamics, dissolved oxygen models, temperature models, food weds, phytoplankton and dissolved oxygen.

FAT 825 : Fisheries Extension and Education (2-Units)
Principles and methods of programme planning extension in fisheries use of mass method, group method, demonstration and individual methods and their merits and demerits. Organization of associations such as angling/handling clubs and cooperatives. Concepts of evaluation applied to fisheries

extension and dissemination of research findings to field workers.

FAT 899: Master's Thesis Research Project (12-Units) **S**tudents will carry out a research project under the supervision of one or more members of academic staff. The research, of which outcome should contribute to knowledge, could be investigative, basics or applied and would in most cases, be directed at solving an identified problem relation to wildlife or Environmental Ecology. The student will be expected to make an oral presentation in departmental seminars of the project plan and/or its progress before or during the investigation and of the outcome at the completion of the research. The provision of a project supervisor notwithstanding, the student should be made to demonstrate independent initiative and motivation, as this will be considered in the project assessment. A final report of the project will be typed and bound in an approved format and the student will be expected to satisfy a panel of internal and external examiners at an oral examination.

MASTER OF PHILOSOPHY (M. Phil/Ph.D.)

PROGRAMMES IN FISHERIES AND AQUACULTURE TECHNOLOGY

1. PROGRAMMES OFFERED:

(a) Master of Philosophy (M.Phil.)
(b) M.Phil./ Ph.D.

2. AVAILABLE OPTIONS/SPECIALIZATION

i. Fisheries Management

ii. Aquaculture

3. PROGRAMME PHILOSOPHY

The Master of Philosophy (M.Phil.) degree programme is post M.Tech. degree of 12 months duration. The programme is designed to provide functional education for Postgraduate students who eventually after the training will proceed into Ph.D. programme and become job creators and also rendering services to private and public sectors. The Academic programme is tailored towards advancement of knowledge in Environmental Control and Management, Biodiversity Management, Fish Production, Utilization, Nutrition, Economics and Advanced Aquaculture for food production and poverty alleviation.

4. THE PROGRAMME OBJECTIVES

The major objectives of the programme are to provide

(i) advanced education and training in the science and technology of fisheries, resources, aquaculture, environmental impact assessment, environmental biodiversity management, industrial bio-nutrients production for sustainable agriculture and poverty alleviation especially in rural areas;

(ii) a solid intellectual and methodological foundations for postgraduate students at M.Phil./ Ph.D. level who will proceed to Doctor of Philosophy in Fisheries and Aquaculture Technology and eventually become job creator and also rendering services to public and private sectors; and

(iii) opportunity for problem solving research studies focused on fish production and utilization, and provision of the necessary raw materials for the national agricultural industries in this sub sectors.

5. PROGRAMME JUSTIFICATION

The programme is intended to foster the development of student's research skills, bridge the gap/deficiency in the M.Tech. programme and enhance their ability to proceed to the Doctor of Philosophy (Ph.D.) degree programme.

6. ADMISSION REQUIREMENTS

(a) M.Phil.

Candidates seeking admission to M.Phil. must have obtained CGPA of not less than 2.5 on 5-point credit scale or a minimum overall score of 50% to 54%.

(b) M.Phil./Ph.D.

Candidates seeking admission to M.Phil./Ph.D. must have obtained CGPA of 3.0 to 3.49 on 5-point credit scale or a minimum overall score of 55% at Masters level.

To qualify for admission into an M.Phil. or M.Phil./Ph.D. Programme, candidate shall

normally possess a Master's degree from this University or any other recognized University in Fisheries, or Aquaculture, Zoology (Fisheries option), Biology (Fisheries option) of other related disciplines. Where necessary, the Department will prescribe additional required courses for any candidate having deficiencies.

7. DURATION OF THE PROGRAMME

(a) M.Phil.

The duration for M.Phil. programme, which will be on a full-time basis, includes a course work and a supervised research project that will cover; a minimum of 12 months and maximum of 18 months.

(b) M.Phil./Ph.D.

The duration for M.Phil./Ph.D. programme will be on a full-time basis between 12 and 18 months. Candidates who fail to meet the minimum requirements for conversion to Ph.D. shall terminate the programme at the M.Phil. level.

8. REQUIREMENT FOR GRADUATION

i). M.Phil. Programme

To be eligible for the award of the M.Phil. Degree in Fisheries Management or Aquaculture, a candidate must have:

(a) passed all the courses recommended by the Department;
(b) successfully presented a minimum of two Departmental seminars: proposal and progress seminars;
(c) successfully completed and defended the research thesis in/at an oral exanimation;
(d) fulfilled all other conditions as prescribed by the Board of Postgraduate Studies of the University; and
(e) a candidate who obtains less than 60% or CGPA of 3.50 on a 5 point credit scale shall not be qualified for admission into the M.Phil./Ph.D. degree programme and shall be awarded a terminal M.Phil. degree

ii). M.Phil./Ph.D. Programme

Candidate is expected to pass a total number of twelve (12) course units which is the research project. At least two seminar presentations must be made before completion of the programme. A report based on the research project must be written and submitted. The candidate may now proceed to conversion to Ph.D.

REQUIREMENTS FOR CONVERSION FROM M.Phil./Ph.D. to Ph.D.

A candidate who enters an M.Phil./Ph.D. programme if he/she fulfils the following requirements:

i. candidate must have successfully presented at least two project seminars:
ii. must have not less than 60% aggregate score at the completion of the research project (12 months minimum);
iii. presented a detailed report of research work done up to the time of seeking conversion and submitted to School of Postgraduate Studies any relevant published and unpublished materials that can be assessed by the Department;
iv. defended the research thesis in a specialized area at an oral examination organized by the School of Postgraduate Studies (SPGS);
v. fulfilled all other conditions as prescribed by the School of Postgraduate Studies (SPGS). Candidates who obtain less than 60% in research project shall not qualify for admission into the Ph.D. programme and shall be awarded a terminal M.Phil. degree; and
vi. candidate must obtain and complete Ph.D. conversion form as appropriate.

9. COURSE OUTLINE

M.PHIL. IN FISHERIES MANAGEMENT AND AQUACULTURE

i. AQUACULTURE OPTION

1st SEMESTER

Course code	Course title	L	T	P	U
FAT 871	Fisheries Statistics and Research Techniques	1	2	0	3
FAT 873	Fish Propagation and Larviculture	2	0	3	3
FAT 875	Fish Processing, Utilization and Marketing	2	0	3	3
	TOTAL				**9**

2nd SEMESTER

Course code	Course title	L	T	P	U
FAT 870	Seminar	0	2	0	2
FAT 872	Fish Nutrition and Aquafeed Technology	2	0	3	3
FAT 874	Aquaculture Economics	2	1	0	3
FAT 889	M.Phil. Research Project	0	0	36	12
	TOTAL				**20**

ii. FISHERIES MANAGEMENT OPTION

1st SEMESTER

Course code	Course title	L	T	P	U
FAT 871	Fisheries Statistics and Research Techniques	1	2	0	3
FAT 877	Ecology of Coastal and Estruarine Environment	2	0	3	3
FAT 879	Fisheries Management Techniques	3	0	0	3
	TOTAL				**9**

2nd SEMESTER

Course code	Course title	L	T	P	U
FAT 870	Seminar	0	2	0	2
FAT 876	Fisheries Resources and Aquatic Biodiversity	2	0	3	3
FAT 878	Fisheries Economics	2	1	0	3
FAT 889	M.Phil. Research Project	0	0	36	12
	TOTAL				**20**

FAT 891 MASTER OF PHILOSOPHY/DOCTORAL RESEARCH PROJECT

M.Phil./Ph.D.

Course code	Course Title	L	T	P	U
FAT/891	M.Phil./Ph.D. Research Project	**0**	**0**	**36**	1

10. M.PHIL. IN AQUACULTURE COURSE SYNOPSES

FIRST SEMESTER

FAT 871: FISHERIES STATISTICS AND RESEARCH TECHNIQUES (3 UNITS)

Experimental designs and Statistics; analysis, sampling methods, information review, report writing and presentation, general laboratory techniques.

FAT 873: FISH PROPAGATION AND LARVICULTURE (3 UNITS)

Fish seeds production, Hatchery design, infrastructures and organization. Brood stock management. Egg incubation, hatching and early fry rearing, Production of live foods. Transport of fish seeds and brood stock. Cryopreservation and genetic manipulation in fishes.

FAT 875: FISH PROCESSING, UTILIZATION AND MARKETING (3 UNITS)

Global fish production, utilizations, consumption, supply and trade, including fisheries and aquaculture hazard analysis and critical control point procedures.

SECOND SEMESTER

FAT 870: SEMINAR (2 UNITS)

Students will be expected to carry out literature review on recent developments in an area of current interests in the field of Fisheries and Aquaculture. The area of the review should not be directly related to the student's research project. An oral presentation of the review will be presented at an organized departmental seminar. The review must be typed, bound and submitted to the Department for assessment.

FAT 872: FISH NUTRITION AND AQUAFEED TECHNOLOG7Y (3 UNITS)

Factors affecting digestibility, Antinutritional factors and antimetabolites, microbial toxins, methods of elimination, nutrient deficiency and symptoms. Nutritional value of feed ingredients live feed, Feed additives (attractants, growth stimulants and probiotics and binders), and Feed resources assessment. Basics of fish and shellfish health management.

FAT 874: AQUACULTURE ECONOMICS (3 UNITS)

Factors affecting fish supply, price determination. Marketing function and services. Cooperative formation. Goals and functions of fishermen cooperative, factors influencing size, role of cooperatives in fisheries economy and government's role.

FAT 889: M. PHIL RESEARCH PROJECT (12 UNITS)

Students will carry out a research project under the supervision of one or more members of academic staff. The research of which outcome should contribute to

knowledge, could be investigate, basic or applied and would in most cases, be directed at solving an identified problem related to fisheries or Environmental Ecology. The student will be expected to make and oral presentation in departmental seminars of the project plan and/or its progress before or during the investigation and of the outcome at the completion of the research. A final report of the project will be typed and bound in an approved format and the student will be expected to satisfy a panel of internal and external examiners at an oral examination.

M.PHIL. IN FISHERIES MANAGEMENT

FIRST SEMESTER

FAT 871: FISHERIES STATISTICS AND RESEARCH TECHNIQUES (3 UNITS)

Experimental designs and Statistics; analysis, sampling methods, information review, report writing and presentation, general laboratory techniques.

FAT 877: ECOLOGY OF COASTAL AND ESTUARINE ENVIRONMENTS (3 UNITS)

Conservation and management of coastal estuaries and lagoon, their resources and development, Anthropogenic impacts on the resources. Environmental impacts on the mangrove and wetlands system. Policy and legislation.

FAT 879: FISHERIES MANAGEMENT TECHNIQUES (3 UNITS)

Growth studies- age determination, food studies, Sampling and collection methods of decapods; sampling for length composition; computer-based length frequency analyses (e.g. FISAT ELEFAN software**);** introduction to remote sensing applications in fisheries (e.g. mapping coastal aquaculture and fisheries structures); statistical consideration in fisheries sampling. Description of various approaches and techniques, the advantages and limitations.

SECOND SEMESTER

FAT 870: SEMINAR (2 UNITS)

Students will be expected to carry out literature review on recent developments in an era of current interest in the field of Fisheries management. The area of the review should not be directly related to the student's research project. An oral presentation of the review will be presented at an organized departmental seminar. The review must be typed bound and submitted to the department for assessment.

FAT 876: FISHERIES RESOURCES AND AQUATIC BIODIVERSITY (3 UNITS)

The ecosystem and life associated with them, freshwater ecosystems and wetlands; marine ecosystems and mangrove forest, food production, job creation, challenges, diseases, pests predators and protection against food security; species inventories; fish gastropod, decapod crustaceans and macro-invertebrate faunas. Environmental conditions (water) and biodiversity.

FAT 878 FISHERIES ECONOMICS (3 UNITS)

Factors affecting fish supply, price determination. Marketing function and services. Cooperative formation. Goal and functions of fishermen cooperative, factors influencing size, role of cooperatives in fisheries economy and government's role.

FAT 889 M. PHIL. RESEARCH PROJECT (12 UNITS)

Students will carry out a research project under the supervision of one or more members of academic staff. The research of which outcome should contribute to knowledge, could be investigate, basic or applied and would in most cases, be directed at solving an identified problem related to fisheries or Environmental Ecology. The student will be expected to make and oral presentation in departmental seminars of the project plan and/or its progress before or during the investigation and of the outcome at the completion of the research. A final report of the project will be typed and bound in an approved format and the student will be expected to satisfy a panel of internal and external examiners at an oral examination.

FAT 891 M. PHIL./Ph.D. RESEARCH PROJECT (12 UNITS)

The candidate will be responsible for the design, analyses and conduct of the study which represents his/her individual research, of which outcome should contribute to knowledge, in most cases should be directed at solving an identified problem relating top Fisheries or Aquaculture. Each candidate is required to prepare theses, which represents the report of the study, in an effectively organized and well written form. The candidate is expected to present at least two seminar papers before the final oral presentation. A final report of the project will be typed and bound in an approved format and the student will be expected to satisfy a panel of internal and external examiners at an oral examination.

LIST OF ACADEMIC STAFF

S/N	NAME	STATUS	SPECIALISATION	EMAIL	PHONE NUMBER
1	Prof. O.O. Olawusi-Peters	Professor	Environmental Biology/Aquatic Ecology	poolawusi@futa.edu.ng	08164005457
2	Prof. O.A. Fagbenro	Professor	Fish Biology and Aquaculture	oafagbenro@futa.edu.ng	08077788688
3	Prof. E.A. Fasakin	Professor	Fish Nutrition and Utilization	eafasakin@futa.edu.ng	08034742109
4	Prof. O.A. Bello-Olusoji	Professor	Fish and Shell Fish Biology	oabelloolusoji@futa.edu.ng	08032659792
5	Prof. E.O. Adeparusi	Professor	Fish Nutrition	eoadeparusi@futa.edu.ng	08067228308
6	Prof. L.C. Nwanna	Professor	Limnology and Fish Nutrition	lcnwanna@futa.edu.ng	08033582428
7	Prof. O.T. Adebayo	Professor	Fish Breeding and Aquaculture	otadebayo@futa.edu.ng	08034039046
8	Prof. A.A. Dada	Professor	Fish Biochemistry and Nutrition	aada @futa.edu.ng	08064364831
9	Prof. O.M. Popoola	Professor	Fish Genetic and Biotechnology	ompopoola@futa.edu.ng	08038349325
10	Dr. O.A. Abidemi-Iromini	Reader	Fisheries Ecology/Environmental Management	oaabidemi-iromini @futa.edu.ng	08136795268
11	Dr. M. L. Adeleke	Reader	Fisheries Economics	mladeleke@futa.edu.ng	08060097865
12	Dr. O.K. Gbadamosi	Snr. Lecturer	Fish Physiology	okgbadamosi@futa.edu.ng	07053332818
13	Dr. T. F. Igejogbo	Snr. Lecturer	Fisheries Management	tfigejogbo@futa.edu.ng	08065693483
14	Dr. O. E. Afe	Lecturer I	Aquaculture	oeafe@futa.edu.ng	08100031354
15	Dr. T. M. Oladipupo	Snr. LecturerI	Aquaculture	tmoladipupo@futa.edu.ng	08030598486

9.1.7 DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY (FST)

1. INTRODUCTION

(a) The Department of Food Science and Technology which is one of the leading Departments fledge in the application of Science and Technology for processing and preservation of Food was established as a full Food Science and Technology and Doctor of Philosophy (Ph. D) Food Science and Technology. The PGD covers 3 semesters which involves taught courses and research project. The M. Tech programme is 4 semester (24 months) 2 semesters of taught courses and 2 semesters of research project. The Doctor of Philosophy (Ph. D) is minimum of 48months of research project.

(b) Justification for Review

The proposed review is aimed at strengthening and broadening the M. Tech programme by introducing two new courses Food Fermentation Technology and Methodology in Nutritional Evaluation Studies. The courses will make the graduates of the Department more relevant to industries in Food Science and Technology and provide the bridge requires in food product development and safety.

2. PROGRAMMES OFFERED

(a) Postgraduate Diploma (PGD)
(b) Master of Technology (M. Tech.)
(c) Doctor of Philosophy (Ph. D)

3. AVAILABLE OPTIONS/SPECIALIZATION

(a) PGD with specializations in Food Science and Technology
(b) M. Tech with specializations in Food Science and Technology
(c) Ph. D with specializations in Food Science and Technology

Areas of Specialization:

(i) Human Nutrition and Metabolism
(ii) Food Chemistry and Analysis
(iii) Post Harvest Technology
(iv) Quality Assurance/ Control
(v) Food Marketing Entrepreneurship

4. PHILOSOPHY AND OBJECTIVES

The objective of postgraduate programmes in the department is to train professional Food Scientist and Technologist who will serve in both private and public sectors of the economy.

The philosophy of the programme is to provide functional education for post-graduate students who eventually after the training will become job makers and job creators, who in addition will be trainers of top level academic and masters of industrial sector.

5. ADMISSION REQUIREMENTS

(i) Candidates with a Higher National Diploma (HND) in Food Science and Technology or allied discipline with not less than Lower Credit level.
(ii) Candidates with a 3rd Class and above in any area of Food Science and Technology or related disciplines from recognized Universities.

(b) Master of Technology in Food Science and Technology (M. Tech)

(i) Candidates must possess 5 Credits at WASCE or SSCE or GCE or NECO at maximum of two sittings with credit in English Language, Mathematics, Chemistry, Biology or Agricultural Science and Physics.
(ii) Candidates with PGD (Upper Credit or Distinction) in Food Science and Technology
(iii) Candidates with first degree in Food Science and Technology or Chemical Engineering, Chemistry, Biochemistry and Agricultural Engineering and related disciplines with a minimum of Second Class Lower Division
(iv) Candidates whose area of specialization is not Food Science and Technology are required to audit some Postgraduate Diploma Courses of the Department.

(c) **Doctor of Philosophy (Ph. D)**

Candidates applying for Ph. D must have the requirement listed in b(i) and b(ii) and possess a Master's degree in Food Science and Technology, or Chemical Engineering, Agricultural Engineering, Chemistry or Biochemistry with a Ph. D grade (60% or CGPA $\geq$ 3.50)

7. COURSE OUTLINE

(a) PGD

FIRST SEMESTER

Course Code	Course Title	L	T	P	U
FST 701	Food Chemistry	2	0	3	3
FST 703	Principles of Human Nutrition	2	0	0	2
FST 705	Food Process Engineering	2	0	3	3
FST 707	Food Analysis	1	0	3	2
FST 709	Food Microbiology	2	0	3	3
FST 711	Fundamentals of Food Quality Control	2	0	3	3
FST 713	Fundamentals of Food Quality Control	**2**	**0**	0	**2**
	Electives				**2**
	TOTAL	**13**	**0**	**15**	**20**

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
FST 700	Course Seminar	0	2	0	2
FST 702	Fermented Foods	1	0	3	2
FST 704	Food Engineering Operations	2	0	0	2
FST 706	Food Laws and Legislations	2	0	0	2
FST 708	Sensory Evaluation of Foods	1	0	3	2
	Electives	2	0	0	2
	TOTAL	**8**	**2**	6	**12**

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
FST 799	PGD Research Project	0	0	0	6
	TOTAL	**0**	**0**	0	**6**

Electives

Course Code	Course Title	L	T	P	Units
FST 710	Computer Programming / Application	2	0	0	2
FST 712	Food Marketing			2	0
3 3 FST 714	Food Product Development	2	0	0	2

(b) M.TECH
FIRST SEMESTER

Course Code	Course Title	L	T	P	U
FST 801	Statistics & Research Techniques	2	0	0	2
FST 803	Food Chemistry	2	0	3	3
FST 805	Advanced Food Technology	1	0	3	2
FST 807	Advanced Food Quality Control and Plant Sanitation	1	0	3	2
FST 809	Post-Harvest Technology of Fruits and Vegetable	2	0	0	2
FST 811	Nutritional Evaluation Methods	1	0	3	2
	Electives	2	0	0	2
	TOTAL	**11**	**0**	**12**	**15**

Electives

Course Code	Course Title	L	T	P	Units
FST 813	Food Irradiation Technology	2	0	0	2
FST 815	Food Business Management and Planning	2	0	0	2

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
FST 800	Course Seminar	0	2	0	2
FST 802	Food Plant Design and Machinery	1	0	3	2
FST 804	Advanced Food Analysis	1	0	3	2
FST 806	Food Biotechnology	1	0	3	2
FST 808	Advanced Human Nutrition	1	0	0	2
FST 810	Advanced Food Process Engineering	1	0	3	2
FST 812	Fermentation Technology	2	0	0	2
	Elective				2
	TOTAL	**7**	**2**	**12**	**16**

Electives

Course Code	Course Title	L	T	P	Units
FST 814	Automatic Control Devices	2	0	0	2
FST 816	Advanced Food Microbiology	2	0	0	2
FST 818	Food And Nutrition Policy	2	0	0	2

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
FST 899	Master's Thesis Research Project				**12**

(c) Ph.D

Course Code	Course Title
FST 999	Doctoral Research Project

7. COURSE SYNOPSES

A. PGD

FST 700: Course Seminar - 2 Units
Review of literature in the area of Food Science and Technology. Student's write-up will be supervised and graded by assigned lecturer for score up to 40 while the seminar is 60, making a total of 100

FST 701: Food Chemistry - 3 Units
Structural, chemical and physical characteristics of proteins, carbohydrates, lipids and vitamins. Food enzymes and their roles in food systems. Post-mortem changes in meat. Toxicants in foods and their degradation in the body.

FST 702: Fermented Foods - 2 Units
Introductory biotechnology, Handling of traditionally fermented foods (e.g. ogi, nono, iru or ogiri, lafun, gari, etc). yeast production, vinegar production, bread, beer and wine production.

FST 703: Principles of Human Nutrition - 2 Units
Metabolism of carbohydrates, proteins and lipids. Determination of energy requirements and expenditures. Protein energy malnutrition. Nutrition and infection. Micronutrient deficiencies. Nutrition and food additives. Food balance and recommended dietary intake.

FST 704: Food Engineering Operations - 2 Units
Unit operations in food processing – Dehydration, evaporation and size reduction, Evaporation filter, Heat transfer theory; mechanisms and application in food processing. Thermophysical properties of food materials. Basic concepts of flow of fluid foods. Methods of calculating lethal rates, heat penetration value, Newtonian and non-Newtonian fluid heat transfers.

FST 705: Food Process Engineering - 2 Units
Thermodynamic properties of food materials. Basic concepts of fluid flow. Power requirements of pumping fluids in the food industry. Pipeline design, Extraction, distillation, evaporation, crystallization leaching, absorption and membrane separations.

FST 706: Food Laws And Legislation - 2 Units
Need for standards and legislation on raw and processed foods. The Codex allimentarius. The Nigerian food standards and legislation problems, formulations, control/monitoring. Food labeling (its value and limitations). Principles of plant sanitation and personal hygiene.

FST 707: Food Analysis - 3 Units
Chemical analysis of food nutrients. Chemical constituents of deteriorated/spoilt foods. Spoilage factors in food (e.g. total volatile nitrogen in meat products, free fatty acid and peroxide value in fatty foods etc) Colour extraction and determination from foods.

FST 708: Sensory Evaluation of Foods - 2 Units
Quality attributes of foods, such as taste, texture, colour, smell and their characteristics. Mechanism of taste and smell perception. Selection, size and use of taste panel in sensory evaluation of food. Training of tasters. The statistical methods used in taste panel and in quality control. Analysis of data from taste panel results. Flavour profile technique in sensory evaluation.

FST 709: Food Microbiology - 3 Units
Sources and significance of microorganisms in foods. Microbial spoilage of foods; general spoilage principles and determining factors. Food preservation principles and techniques. Microbiology of foods and beverage fermentation and related processes. Microbial food borne infections and intoxications (including mycotoxicosis). Food sanitation; microbiological quality control methods and standards.

FST 710: Computer Applications - 3 Units
Introduction to problem solving methods and algorithm development. Designing, coding, debugging and documenting programmes using techniques of a good programming language style. Computer organization.

FST 711: Food Process Technology - 3 Units
Processing of cereals, legumes, cocoa, tea, coffee, flour and bakery products. Wine and soft drink production. Oil seed processing and utilization. Fish, meat and poultry processing. Manufacture of dairy products. Production of sugar products from tuber and roots. Principles and application of canning of foods. Types of faults in cans. Irradiation principle. Extrusion cooking technology and functional foods.

FST 712: Food Marketing and Management - 2 Units
Advance marketing management problem solving decision. Price determination. Distribution management. Management of the product needs. Analysis of the marketing concepts, marketing philosophies and organization. Relevance of marketing communication into organization's survival. Consumer behavior and consumerism.

FST 713: Fundamentals of Food Quality Control - 2 Units
Fundamental principles of quality control sequences and organization of quality control laboratory. Statistical quality control – types of errors and decision making; control charts for variables and attributes – construction and uses; sampling plan.

FST 714: Food Product Development - 2 Units
Objectives of product development. Stages in food product development. Selection and testing of materials. Development and assessment of food products. Packaging, Pilot plant establishment and assessment. Industrial plant installation and optimization.

FST 799: PGD Research Project - 6 Units
A research project is expected to be fully completed by the student under the supervision of an academic staff. A comprehensive report is to be submitted after the presentation of a Departmental seminar.

B. MASTER OF TECHNOLOGY (M. TECH)

FST 800: Course Seminar - 2 Units
Students will be expected to carry out literature review on recent developments in an area of current interest in the field of Food Science and Technology. The area of the review should not be directly related to the student's research project. An oral presentation of the review will be presented at an organized departmental seminar. The review will be presented at an organized departmental seminar. The review must be typed, bound and submitted to the department.

FST 801: Statistics and Research Techniques - 2 Units
Experimental planning and designs. Data collection, analysis and interpretation. Use of computer for data analysis. Preparation and presentation of scientific reports.

FST 802: Food Plant Design And Machinery - 2 Units
Materials for construction of food processing equipment. Design of food machinery for canning, drying, heat exchange, size reduction, mixing, evaporation, packaging and cold storage.

FST 803: Food Chemistry - 3 Units
Structural, chemical and physical characteristic of food nutrients. Chemical reactions of protein, carbohydrates, lipids and vitamin. Food enzymes and their roles in food systems. Biochemical changes that occur in food during handling, processing and storage. Toxicants in foods and their degradation.

FST 804: Advanced Food Analysis - 2 Units
Analytical methods such as colorimetry, polarimetry and refractometry. Theory of High performance liquid chromatographic methods, electrophoresis, Gas liquid Chromatography for food analysis. Physical and chemical analyses of major constituents of vitamins, food colours, additives, trace metals and contaminants in food. Atomic absorption spectrophotometry, flame photometry, infra red spectrophotometry, mass spectrometry and their applications in food analysis. Enzymatic methods in food analysis.

FST 805 : Advanced Food Technology - 2 Units
General principles of size reduction of solids. Equipment for slicing, dicing, shredding and pulping. Separation operations including centrifugation, filtration, extraction and crystallization. Mixing of liquids, pastes, powders and emulsification. Preparation of foods for processing. Drying of foods using heated air, hot surfaces and freeze-drying. Principles and equipment for freezing. Heat processing of foods, including canning, pasteurization and UHT treatments (including physical and chemical changes occurring during the various food processing operations).

FST 806 : Food Biotechnology - 2 Units
Novel biotechnological applications and processes in the food industry, including development in genetic engineering. Enzyme production – application of enzymes in food processing. The production of organic and amino acid. Microbial protein production. Diagnostics and rapid methods in the food industry. Biosensors. Fermented Foods – starter cultures, genetics and biochemical aspects. Hygiene and safety.

FST 807:Advanced Food Quality Control and Plant Sanitation - 2 Units
Principles of quality assurance: quality attributes of food and methods of evaluation. Effects of raw material quality and the various types of food processing method on yield and quality of the products. Microbiology control of food quality. Food plant organization and management. Quality control and operations research in the food industry. Sanitation in the food industry.

FST 808: Advanced Human Nutrition - 2 Units
Selected Topics on Any of The Following:
(i) Current reviews on the effects of processing of Nurtitive Values of Foods including fortifications and anti-metabolites' effects after processing.
(ii) Current reviews on Protein – Energy – Malnutrition (PEM) especially as it affects Nigeria.
(iii) Current reviews on Micro-nutrients including VITAMINS and MINERALS in human nutrition.
(iv) Current Reviews on Nutritional disorders emanating from lipid and/or carbohydrate metabolism.

FST 809:Post-Harvest Technology of Fruits and Vegetables - 2 Units
Climacteric and non-climacteric fruits. Biochemical changes accompanying fruits and vegetable ripening. Post harvest losses and estimation in fruits and vegetables. Processing (canning, dehydration, freezing, irradiation, etc); yield and cost calculation.

FST 810: Advanced Food Process Engineering - 2 Units
The flow of fluids under different conditions. Fluid motions and flow of fluids in pipelines. Fittings and pumps. Pneumatics and hydraulic conveying. Transfer of heat by conduction, radiation and convection, and in condensation and boiling. Applications of 1st and 2nd Laws of thermodynamics to heat engines.Steam generation, compression and turbines. Refrigerants, their thermodynamic properties and refrigeration cycle of operation. Food freezing and cold storage. Basic theory of process control. Control systems for pressure, temperature, flow and level. Materials use for construction food plant.

FST 811:Nutritional Evaluation Methods - 2 Units This course involves the use of experimental animals in Nutritional research. Animal groupings based on age, weight and statistical significance will be taught. Length of experimental periods and collection of urine, faeces and metabolic data will be discussed. Calculation of BV, NPU, PER etc. and haematological studies. Formulation of artificial diets and their significance will also be include. Practicals will be organized using metabolic cages for rats and other small species.

FST 812: Fermentation Technology - 2 Units Principles of food fermentation: bacteria, yeasts and moulds and their roles in food fermentation. The role of enzymes in food fermentation, factors affecting food fermentation, biochemical and microbiological processes involved in food fermentations; types of fermentors and their uses. Production and characteristics of fermented foods like Alcoholic (beer, enanol) vinegars, lactic acid fermentation (yoghurt, etc). Wholesomeness and nutritional quality of fermented foods.

FST 813 : Food Irradiation Technology - 2 Units
Characteristics of ionizing radiation. Interaction of radiation with matter. Radiation chemistry of foods. Dosimetry of food irradiation. Operation and safety of commercial and research food irradiation facilities. Radiation effects on microorganisms, insects and parasites. Irradiation decontamination of fruits and vegetables, roots and tubers, fish, spices, condiment and export crops. Economic feasibility and consumer acceptability of irradiated foods. Regulatory aspects of food irradiation. Trends in the world trade of irradiated foods.

FST 814: Automatic Control Devices - 2 Units
An overview of process control used in the food industry and future projections to overcome some inherent problems. Response of process controls to different types of signals. Open and feedback control systems, process dynamics and signals.

FST 815:Food Business Management and Planning - 2 Units
The purpose and scope of management, development of management thinking and practice. Management peculiarities of food industries. Marketing concept and marketing mix. Food business law. Basic accounting for food industry managers. Preparation of feasibility studies for food based industries.

FST 816 : Advanced Food Microbiology - 2 Units
Characteristics and ecology of microorganisms of importance in food-borne diseases. Methods and techniques of isolation and identification., factors affecting their growth and survival in relation to food processing and preservation. Food sampling. Specialized fermentations including alcoholic, lactic acid fermentations, etc. microbiological criteria for foods, quality assurance, hygiene including appropriate aspects of process plant sanitation.

FST 818: Food Nutrition and Economic Development - 2 Units
Conceptual framework for policy development. Food and nutrition situation appraisal. Policy formulation and implementation. Organization, coordination, monitoring and evaluation of food and nutrition policy. Review of agricultural policy in Nigeria.

FST 899: Master's Thesis Research Project - 12 Units An original investigation in a title approved by the School of Postgraduate Studies. A thesis must be completed with significant contribution to knowledge. The thesis shall be defended in an open oral examination organized by the School of Postgraduate Studies.

(c) Ph.D
FST 999: Doctoral Research Project

LIST OF ACADEMIC STAFF

S/N	NAME	STATUS	GSM NO.
1.	Prof. Enujiugha V. N.	Professor	08034261870
2.	Prof. (Mrs.) Oludahunsi O.F.	Professor	08035798813
3.	Prof. Oluwalana I. B.	Professor	08033976209
4.	Prof. Oluwamukomi M. O.	Professor	08060137692
5.	Prof. (Engr.) Olumurewa J.A.V.	Professor	08062966602
6.	Prof. (Mrs.) Omoba, O. S.	Professor	07064880493
7.	Prof. Bolade M. K.	Professor	08035019525
8.	Prof. Badejo, A. A.	Professor	08101802034
9.	Prof. (Mrs.) Ifesan, B. O. T.	Professor	08134986995
10.	Prof. (Mrs) Ayo-Omogie, H. N.	Professor	08033861888
11.	Prof. Awolu, O. O.	Professor	08062204766
12.	Dr. Aderinola T.A.	Snr. Lecturer	07036569677
13.	Dr. Jolayemi O.S	Snr. Lecturer	09064749658
14.	Dr. (Mrs.) Akinyede, A. I.	Snr. Lecturer	07036555831
15.	Dr. (Mrs.) Adegbanke, O. R.	Snr. Lecturer	08036463544
16.	Dr. (Mrs.) Akande, O. A.	Snr. Lecturer	08030743763
17.	Dr. (Mrs) O. M. Lawal	Lecturer I	07030250802
18.	Dr. A. L. Lawal	Lecturer I	

9.1.8 DEPARTMENT OF FORESTRY AND WOOD TECHNOLOGY (FWT)

DEGREES BEING AWARDED

(i) M. Agric. Tech.
(ii) Ph.D

OBJECTIVES

The objectives of the Postgraduate Degree Programme are to train highly skilled manpower in the science and technology of forest management and utilization. The Programme is designed to extend the frontiers of forestry education and scientific research aimed at increasing the benefits derived from the forest, promoting more efficient forest management and utilization and protecting environmental values.

SPECIALIZATION

At the postgraduate level, areas of specialization within the Department are as follows:

In Forestry

a. Forest Management
b. Forest Biology/Silviculture
c. Soils/Agroforestry
d. Forest Economics
e. Forest Inventory/Biometrics

In Wood Technology

a. Wood Science
b. Wood Products Technology

ADMISSION REQUIREMENTS

In addition to the University's general regulations and guidelines on admission, graduates in the following disciplines will be qualified for admission:

(i) Forestry
(ii) Agriculture and allied fields
(iii) Botany

(a) M. Agric. Tech.

(i) Holders of first degree (with minimum of Second Class Lower Division) of the Federal University of Technology, Akure or any other recognized University.
(ii) Holders of Higher National Diploma (HND) Upper Credit plus Postgraduate Diploma in Forestry related courses with Minimum of 60% average are eligible for admission.

(b) Ph.D.

Holders of Masters degree in relevant disciplines of the Federal University of Technology, Akure or any other recognized University with Minimum of 60% average is eligible for admission.

DEGREE REQUIREMENTS:

1. Master of Agric. Technology (M. Agric. Tech.) Degree

(i) The M. Agric. Tech. Programme will normally last a minimum of 18 months full- time.
(ii) The programme is by course work and research and it is geared towards the needs and the background of each student. Thus, while the core courses will be taken by all students, the electives for each student will be determined in consultation with his supervisors or the Departmental Postgraduate Coordinator. A minimum total of 30 units of study are required for graduation.
(iii) A dissertation describing an original work carried out by each student while studying for the degree shall be submitted according to University regulations.
(iv) After the submission of a dissertation, each student shall be examined orally by a Panel of Examiners approved by the Postgraduate School and Senate.

2. Doctor of Philosophy (Ph.D.) Degree

(i) The Ph.D. programme shall normally last a minimum of 36 months for full-time students and a minimum of 48 months for part-time students.
(ii) The programme shall be assessed by research work. However, course work shall be required by students found deficient in relevant areas. Such students shall be required to pass a qualifying examination at an average of 60% after completing the course work.
(iii) A candidate registered for the Ph.D. degree programme must, in consultation with his supervisors, submit a comprehensive research proposal to the Department and present a proposal seminar within the first year of study.
(iv) On completion of the research work, the candidate is expected to present an end-of- project seminar in the Department. A thesis describing the original work carried out while studying for the degree and written in the format specified by the Postgraduate School must be submitted at the end of the programme.
(v) After submission of a thesis, the candidate will be examined orally by a Panel of Examiners according to the University regulations.

COURSE OUTLINE

The underlisted core courses shall be taken by all M. Agric.

Tech. students in the Department. Specialization courses shall be selected from the list of electives. In addition, students may also take and receive credits for relevant courses at the M. Agric. Tech. level in other relevant Departments. Candidates found to be deficient in certain areas of the undergraduate programme shall be required to audit such courses. The courses offered by the Department at Master's level are as follows:

(a) M.Tech: FIRST SEMESTER

Course Code	Course Title	U	
FWT 801	Biometrics	3	
FWT 803	Properties of wood in relation to Utilization		2
FWT 805	Sawmilling	2	
FWT 823	Advanced Forest Management		2
FWT 827	Wood Chemistry	2	
FWT 890	Research Project	6	
	TOTAL	**17**	

Electives

Course Code	Course Title	Units
FWT 807	Wood Harvesting and Transportation	2
FWT 809	Economics of Wood Processing & Marketing	3
FWT 829	Wood Machining and Tools	2

SECOND SEMESTER

Course Code	Course Title	Units
FWT 800	Seminar	2
FWT 802	Wood Composites	3
FWT 804	Pulp and Paper Technology	2
FWT 806	Wood Preservation and Seasoning	2
FWT 828	Research Techniques and Report writing	2
FWT 890	Research Project	6
	TOTAL	**17**

Courses for Postgraduate Programme in M. Agric. Tech. (Forest Management, Economics, Inventory / Biometrics, Silviculture/Biology and Soils/ Agroforestry)

FIRST SEMESTER

Course Code	Course Title	U
FWT 801	Biometrics	3
FWT 803	Properties of Wood in Relation to Utilisation	2
FWT 811	Advanced Silviculture	2
FWT 813	Advanced Forest Mensuration	2
FWT 823	Advanced Forest Management	2
FWT 890	Research project	6
	TOTAL	**17**

Electives

Course Code	Course Title	Units
FWT 815	Tree Nutrition and Forest Soil Management	2
FWT 817	Agroforestry Systems	2
FWT 819	Quantitative Plant Ecology	2
FWT 821	Forest Resources Economics	2
FWT 825	Resource Inventory Analysis	2
AEE 803	Advanced Economics Theory	2
AEE 805	Quantitative Methods	3

SECOND SEMESTER

Course Code	Course Title	Units
FWT 800	Seminar	2
FWT 812	Social & Environmental Forestry	2
FWT 814	Project Evaluation in Renewable Resources	2
FWT 818	Remote Sensing and GIS in Forestry	3
FWT 828	Research Techniques and Report Writing	2
FWT 890	Research Project	6
	TOTAL	**17**

Electives

Course Code	Course Title	Units
WT 816	Land Evaluation for Forestry	2
FWT 820	Advanced Sampling Techniques	2
FWT 822	Selected Topics in Advanced Forest Biometrics	3
FWT 824	Advanced Forest Products Marketing	2
FWT 826	Tree Improvement & Conservation of Genetic Resources	3
AEE 802	Agricultural Prices & Marketing	3
AEE 804	Advanced Production Economics & Resource Use	3

7. COURSE SYNOPSES

FWT 801: Biometrics (3 Units)
Basic parametric & non-parametric statistics; Analysis of Variance and its application in various Experimental Designs; Correlation and Regression analysis; Analysis of Covariance.

FWT 802 : Wood Composites (3 Units)
Raw materials, process and production parameters in the manufacture of plywood, particleboard; theoretical consideration, utilization of the panel products.

FWT 803: Wood Properties in relation to Utilization (2 Units)
The anatomy of wood and its relationship with other wood properties – physical and mechanical properties; anisotropy and its influence on methods of wood utilization; moisture/ wood relationships; wood deterioration and properties desired from various end uses.

FWT 805 : Sawmilling (2 Units)
General overview of sawmilling, Raw materials for Sawn wood, Sawmilling processes, mill layout, sawmilling products, conversion and mill handling equipment, wood waste

extraction and pollution control measures, raw materials and efficiency calculations.

FWT 806: Wood Preservation and Seasoning (2 Units) Agents of wood deterioration; methods of wood protection from deterioration.Application of chemical preservatives – non-pressure and pressure methods; methods of wood seasoning and drying defects.Chemical modification of wood to improve dimensional stability and resistance to fire and weathering.

FWT 807: Wood Harvesting and Transportation (2 Units)
Forest Assessment; Harvesting Operation; Principal Equipment for Harvesting; Methods of Log transportation.

FWT 808: Wood Adhesives, Finishes and Fasteners (3 Units)
Introduction to nature of adhesive; structure, properties, application and uses of adhesives in bonding wood products, testing and characterization of bonded wood products; types and application of wood finishes; mechanical wood fasteners.

FWT 809: Economics of Wood Processing and Marketing (3 Units)
Review element of economic theory and economic institutions in relation to business practices; applied economics in relation to the following: Sawmilling, Wood-based panel production, pulp and paper mills; Marketing of wood products, cost structure, productivity and profitability, future trends in wood based industrial development in Nigeria.

FWT 810: Wood Structures (2 Units)
Design of various structural forms of wood. Exterior structures including bridges and marine structures; building specification methods in accordance with the Nigerian Code of Practice (NCP 2:1973); The use of Timber in Building Construction.

FWT 811: Advanced Silviculture (2 Units)
The concept, definition and utility of Silvics; Climatic factors affecting tree growth; Forest stand development; qualitative and quantitative variables of stand evaluation; site classification; planning large scale afforestation project; silvicultural control of wood quality.

FWT 812: Social and Environmental Forestry (2 Units) Role of social forestry in environmental stability; forestry for rural development; non-timber forest benefits; assessment of environmental conservation measures.

FWT 813: Advanced Forest Mensuration (2 Units) Growth and increment of individual trees and stands; concept of stand structure and Diameter Distribution models; Site quality assessment; Measures of stand density; Growth and Yield estimation; Modeling forest growth and yield prediction.

FWT 814: Project Evaluation in Renewable Resources (2 Units)
Classification of renewable resource project; project evaluation techniques; Comparison of UDR and IRI; estimation of costs and revenues; special problems in project evaluation in developing countries.

FWT 815: Tree Nutrition and Forest Soil Management (2 Units)
Nutrient Cycling in Forest ecosystems, Silvicultural implication of nutrient cycling, soil properties and site productivity; nursery soil diagnosis; impact of intensive forestry activities on long-term site productivity.

FWT 816: Land Evaluation for Forestry (2 Units) Nature and purpose of land evaluation, principle and basic concepts; procedure and planning of land evaluation; forest land utilization types; land use requirements; Survey and land studies; matching land use with land; environmental impact, social and economic analysis; land suitability classification.

FWT 817: Agroforestry Systems (2 Units)
The concept of agroforestry; agroforestry practices in the tropics; classification of agroforestry systems; tree/crop interaction in agroforestry; economic concepts of agroforestry; diagnosis and design of agroforestry systems.

FWT 818: Remote Sensing and GIS in Forestry (2 Units)
Overview of remote sensing applications in forestry; Geographic Information System (GIS) and its use in forestry; vector data analysis; raster data analysis; map production from satellite imageries; hands-on training on the use of selected GIS software.

FWT 819: Quantitative Plant Ecology (2 Units) Distribution, structure and dynamics of forest and savanna ecosystems; Ecological modeling and systems analysis.

FWT 820: Advanced Sampling Techniques (2 Units) Survey of literature and application of specialized sampling techniques in natural resources studies. Detailed consideration of relevant probability and non-probability sampling techniques.

FWT 821: Forest Resources Economics (2 Units) Economic approach to forest production; organization for resource decisions and investment allocation; economics of resource conservation.

FWT 822: Selected Topics in Advanced Forest Biometrics (3 Units)
Mixed models analysis; Compounding and fractional replication in factorial experiments; incomplete block designs; multivariate analysis, such as factor analysis, discriminant analysis and cluster analysis; response surface analysis; other emerging topics in forest biometrics.

FWT 823:Advanced Forest Management (2 Units) Business methods and technical forestry principles in the operation of a forest property; case studies of management problems with particular emphasis on plantation forestry; applications of operation research in forestry.

FWT 824: Advanced Forest Products Marketing (2 Units)
Analysis of forest products marketing problems; planning marketing programmes; forecasting market trends; sales promotion strategies; analyses of costs and profits.

FWT 825 :Resource Inventory Analysis (2 Units)
Manual data processing; Electronic data processing; application of common software for inventory data analysis; introduction to computer programming for forestry applications.

FWT 826: Tree Improvement and Conservation of Genetic Resources (3 Units)
Variation, selection and breeding in tree improvement; Seed Orchards; Clonal and offspring testing; in situ conservation of gene resources.

FWT 827: Wood Chemistry (2 Units)
Chemical nature of wood and the analysis of important reactions of their constituents, include cellulose, hemicelluloses, lignin and associated materials.

FWT 828: Research Techniques and Report Writing (2 Units)
Problem identification; Formation of research objectives; Literature review methodologies; Development of appropriate research methodologies; Data collection strategies; Data handling processing and utilization; Administration and monitoring of projects; Budget preparation; Ethical considerations in research; Report writing/manuscript writing – research proposal writing, dissemination of research results.

FWT 829: Wood Machining and Tools (2 Units)
Organisation of wood processing operations.Advanced concept on theory of cutting as it applies to wood; Basic operations and tools in the wood industries – sawing, planing, drilling, sanding, etc.

FWT 830: Research Project (12 Units)
Independent research on topics within the area of forestry and wood technology, chosen in consultation with the student's supervisor. A thesis will be submitted on completion in partial fulfillment of the requirement for the award of M. Agric Tech. degree.

FWT 832: Finished Products of Wood (2 Units)
Classification of finished products. Design concepts and product development. Basic furniture production processes, industrial products of wood (pre-fabricated wooden houses, boxes, drums, sport articles, boats, musical instruments, match splits, pencils, school articles, etc.).

FWT 834: Ergonomics and Labour Relations (2 Units)
Basic concepts of ergonomics, overview of forest work, human aspect of work, Interrelationship between man and work, man's needs in working environment, work safety and accident prevention.

LIST OF ACADEMIC STAFF

S/N	NAME	STATUS	AREA OF SPECIALIZATION
1	PROF. A.G. ADEDAYO	PROFESSOR	Forest Policy, Law and Administration
2	PROF. J.A.FUWAPE	PROFESSOR	Wood Products Engineering
3	PROF. S.O. AKINDELE	PROFESSOR	Biometrics & Forest Measurements/GIS
4	PROF. M. B. OYUN	PROFESSOR	Silviculture and Forest Biology
5	PROF. B. AJAYI	PROFESSOR	Wood Science and Biocomposites
6	PROF. J.C.ONYEKWELU	PROFESSOR	Silviculture and Forest Management
7	PROF. D.O. OKE	PROFESSOR	Agroforestry
8	PROF. V.A.J.ADEKUNLE	PROFESSOR	Forest Inventory and Ecology
9	PROF. S. A. ADEDUNTAN	READER	Forest Entomology
10	PROF.(Mrs.) O.V.OYERINDE	PROFESSOR	Forest Economics
11	PROF. J. M. OWOYEMI	PROFESSOR	Wood Technology
12	DR. (MRS.) O. O. SOBOLA	SNR.LECTURER	Agroforestry and Soil
13	DR. A. LAWAL	SNR.LECTURER	Forest Genetics

9.2 COLLEGE OF HEALTH SCIENCES
SCHOOL OF BASIC MEDICAL SCIENCES

DEPARTMENT OF HUMAN ANATOMY

CURRICULUM FOR MASTERS IN ANATOMY (M.Sc.) PROGRAMME

1. PROGRAMME OFFERED

Masters of Science (M.Sc.)

2. AVAILABLE OPTIONS/SPECIALISATION

a) Reproductive Biology
b) Neurobiology
c) Anthropology and Forensic Anatomy
d) Applied Anatomy and Medical Imaging

3. PROGRAMME PHILOSOPHY

The Masters in Anatomy (M.Sc. Anatomy) degree is mainly by course work and research project in Anatomy. In the first year of the M.Sc. Anatomy programme, which consists of two semesters, students are expected to successfully complete the core and/or elective courses in the programme to be eligible to start their theses in the first semester of the second year. Each course will be assessed based on a written continuous assessment and final examination at the end of the semester. Additionally, students will independently carry out a research project, submit a written thesis and defend their project orally to be considered to have met the requirement for the award of the M.Sc. Anatomy degree. The programme is designed to provide contemporary training and translational knowledge in the areas of Anatomy Pedagogy, Clinical Anatomy, Neurobiology, Forensic Sciences, Anthropology and Anthropometry, Medical Imaging, Histopathological Anatomy, Developmental Biology, Endocrinology and Reproductive Biology, Molecular biology and Medical Genetics which are highly relevant areas of intense biomedical research and applications in academia, medical institutions, industries, private and public sectors. The M.Sc. Anatomy degree programme provides much needed research and leadership professionals for academia, biomedical research institutions, hospital, medical facilities, health-focused government and non-governmental organizations and industry.

4. PROGRAMME OBJECTIVES

The objectives of the programme are to:

a) equip graduates of the program with the contemporary skills, modern techniques, and relevant competencies necessary to drive high impact biomedical research towards improved health nationally and globally;
b) provide and promote relevant theoretical and practical training in Anatomy Pedagogy, Clinical Anatomy, Neurobiology, Forensic Sciences, Anthropology and Anthropometry, Medical Imaging, Histopathological Anatomy, Developmental Biology, Endocrinology and Reproductive Biology, Molecular Biology and Medical Genetics;
c) to train highly skilled manpower for the needed didactic and education needs of the human anatomy programme in Nigeria;
d) to provide graduates with specialist and professional capacity hugely relevant to health agencies at local, state, and federal levels, environmental- and ecology-oriented agencies and firms, occupational health fields, hospitals, and clinics; and
e) train Anatomy personnel that can function effectively in the medical, basic medical, allied health, other biomedical establishments and related disciplines.

5. PROGRAMME JUSTIFICATION

There is the need to engage specialist anatomy professionals with relevant knowledge and technical capacity in the practice of anatomy in medical and allied institutions, industries, health establishments, education, and public service. M.Sc. Anatomy is needful to contribute to the technological and economic development of the nation and globally particularly with regards to human health. Graduates in M.Sc. Anatomy will be adequately prepared to undertake PhD programmes and other advanced biomedical subjects. Graduates will be motivated towards and engaged in continuous professional development, through individual efforts and advanced professional education.

6. ADMISSION REQUIREMENTS

Candidate must satisfy the general regulations governing postgraduate studies at The Federal University of Technology, Akure. In addition, the following Departmental requirements must be satisfied:

a) B.Tech. or B.Sc. in Anatomy, Physiology, Physiotherapy from the Federal University of Technology, Akure or from any other recognized University with at least a Second Class Honours (Lower Division), or

b) Bachelor of Medicine and Surgery and Bachelor of Dental surgery from the Federal University of Technology, Akure or from any other recognized University.

Furthermore, candidates possessing a Bachelor's Degree in Zoology with specialization in primate biology with at least a Second Class Honours (Upper Division), may also be considered. ***Note: 1)*** *Non-B.Sc. Anatomy holders may be required to take additional anatomy courses as audited courses;* ***2)*** *Entry exams and/or interviews may be conducted for prospective candidates to the M.Sc. programmes with due permission from the School of Postgraduate Studies.*

7. PROGRAMME DURATION

The M.Sc. programme shall be full-time for a duration of 18 – 24 months. The first two semesters shall be by course work and examinations. The third semester shall be by thesis based on a research proposal submitted and approved at the end of second semester.

8. GRADUATION REQUIREMENTS

To be eligible for the award of the M.Sc. degree in Anatomy, a candidate must have:

a) passed all the courses recommended by the Department for the approved area of specialization;
b) successfully presented at least two seminars: proposal and final seminars;
c) present evidence of one (1) manuscript submission in a reputable journal to the Board of the School of Postgraduate Studies of the University; and
d) successfully defended a research thesis in an oral examination by a Panel of Examiners.

9. COURSE OUTLINE

9.1 M.Sc. Anatomy (Reproductive Biology)

First Semester

Course Code	Course Title	L	T	P	Unit
ANA 801	Laboratory Techniques and Regional Dissection I	0	0	3	1
ANA 803	Advanced Gross and Applied Anatomy	3	0	0	3
ANA 805	Developmental Anatomy and Teratology	3	0	0	3
ANA 807	Advanced Histology and Histochemistry	2	0	3	3
ANA 809	Introductory Neuroscience	2	0	0	2
ANA 811	Endocrinology	3	0	0	3
	Total				**15**

Second Semester

Course Code	Course Title	L	T	P	Unit
ANA 802	Laboratory Techniques and Regional Dissection II	0	0	3	1
ANA 804	Medical Genetics and Molecular Biology	3	0	0	3
ANA 806	Research Methods and Biostatistics	3	0	0	3
ANA 808	Seminar	0	0	9	3
ANA 810	Reproductive Biotechnology	3	0	0	3
ANA 812	Advanced Histology of the Reproductive systems	1		3	2
	Total				**15**

Third Semester

Course Code	Course Title	L	T	P	Unit
ANA 899	MSc Research Project and Thesis	0	0	36	12

9.1.2 M.Sc. Anatomy (Neurobiology)

First Semester

Course Code	Course Title	L	T	P	Unit
ANA 801	Laboratory Techniques and Regional Dissection I	0	0	3	1
ANA 803	Advanced Gross and Applied Anatomy	3	0	0	3
ANA 805	Developmental Anatomy and Teratology	3	0	0	3
ANA 807	Advanced Histology and Histochemistry	2	0	3	3
ANA 809	Introductory Neuroscience	2	0	0	2
ANA 811	Endocrinology	3	0	0	3
	Total				**15**

Second Semester

Course Code	Course Title	L	T	P	Unit
ANA 802	Laboratory Techniques and Regional Dissection II	0	0	3	1
ANA 804	Medical Genetics and Molecular Biology	3	0	0	3
ANA 806	Research Methods and Biostatistics	3	0	0	3
ANA 808	Seminar	0	0	9	3
ANA 814	Advanced Neuroscience	3	0	0	3
ANA 816	Biology of Neurological Disorders	2	0	0	2
	Total				**15**

Third Semester

Course Code	Course Title	L	T	P	Unit
ANA 899	MSc Research Project and Thesis	0	0	36	12

9.1.3 M.Sc. Anatomy (Anthropology and Forensic Anatomy)

First Semester

Course Code	Course Title	L	T	P	Unit
ANA 801	Laboratory Techniques and Regional Dissection I	0	0	3	1
ANA 803	Advanced Gross and Applied Anatomy	3	0	0	3
ANA 805	Developmental Anatomy and Teratology	3	0	0	3
ANA 807	Advanced Histology and Histochemistry	2	0	3	3
ANA 813	Comparative Mammalian Anatomy	3	0	0	3
ANA 815	Forensic Science	2	0	0	2
	Total				**15**

Second Semester

Course Code	Course Title	L	T	P	Unit
ANA 802	Laboratory Techniques and Regional Dissection II	0	0	3	1
ANA 804	Medical Genetics and Molecular Biology	3	0	0	3
ANA 806	Research Methods and Biostatistics	3	0	0	3
ANA 808	Seminar	0	0	9	3
ANA 818	Mortuary Science and Funeral Directing	2	0	0	2
ANA 820	Forensic Anthropology	3	0	0	3
	Total				**15**

Third Semester

Course Code	Course Title	L	T	P	Unit
ANA 899	MSc Research Project and Thesis	0	0	36	12

9.1.4 M.Sc. Anatomy (Applied Anatomy and Medical Imaging)

First Semester

Course Code	Course Title	L	T	P	Unit
ANA 801	Laboratory Techniques and Regional Dissection I	0	0	3	1
ANA 803	Advanced Gross and Applied Anatomy	3	0	0	3
ANA 805	Developmental Anatomy and Teratology	3	0	0	3
ANA 807	Advanced Histology and Histochemistry	2	0	3	3
ANA 813	Comparative Mammalian Anatomy	3	0	0	3
ANA 817	Microscopic Techniques	2	0	0	2
	Total				**15**

Second Semester

Course Code	Course Title	L	T	P	Unit
ANA 802	Laboratory Techniques and Regional Dissection II	0	0	3	1
ANA 804	Medical Genetics and Molecular Biology	3	0	0	3
ANA 806	Research Methods and Biostatistics	3	0	0	3
ANA 808	Seminar	0	0	9	3
ANA 822	Surface and Living Anatomy	2	0	0	2
ANA 824	Radiological Anatomy	3	0	0	3
	Total				**15**

Third Semester

Course Code	Course Title	L	T	P	Unit
ANA 899	MSc Research Project and Thesis	0	0	36	12

10. *COURSE SYNOPSES*

ANA 801 Laboratory Techniques and Regional Dissection I (1 Unit)
Three hours of practical per week for cadaveric dissection or histological techniques through supervision of undergraduate practical sessions and/or direct practical sessions by postgraduate students.

ANA 802 Laboratory Techniques and Regional Dissection II (1 Unit)
Three hours of practical per week for cadaveric dissection or histological techniques through supervision of undergraduate practical sessions and/or direct practical sessions by postgraduate students.

ANA 803 Advanced Gross and Applied Anatomy (3 Units)
Mammary gland and its clinical relevance, Brachial plexus and its clinical relevance, Carpal tunnel and clinical importance, Spaces of the hand and clinical importance, Femoral triangle and its clinical importance, Knee joint with its clinical importance, Arches of the foot and clinical relevance, Hernias associated with the lower limb, Gaits and its abnormalities, Lungs and bronchopulmonary segment and its clinical importance, Heart and great vessels with clinical importance, Diaphragm and its clinical relevance, Gut with its clinical relevance, Liver, Spleen and Pancreas with clinical relevance, Kidney and its clinical relevance, Pelvimetry and its clinical importance, Comparing the male and female perineum and pelvis with clinical relevance, Prostate gland with its clinical relevance, Rectal and anal canal haemorrhoids, Face and scalp with its clinical relevance, Cranial cavity, Orbit, Temporal and infratemporal regions, Triangles of the neck, Submandibular regions, Surface anatomy of Head and Neck.

ANA 804 Medical Genetics and Molecular Biology (3 Units)
Introduction, Molecular basis of Genetics/Gene, Mendelism, Inheritance patterns in Mendelian heredity, Multifactorial inheritance, Crossing over/linkages/meiosis, Chromosome studies/mapping, Mutation and mutagenesis, DNA repair, genetic disease and treatments, genetic counselling, developmental genetics, population genetics, dermatoglyphics and genetics, basics in Epigenetics. Introduction to Molecular Biology, Gene Injection, Oncogenes, Homeobox genes; DNA structure, gene, Reverse Transcriptase enzyme, DNA polymorphism, DNA sequencing, Genomics, Proteomics and Transcriptomics.

ANA 805 Developmental Anatomy and Teratology (3 Units)
Review of General and systemic embryology, Introduction to Experimental Embryology, Totipotency and Developmental Potential, Embryo manipulations, Early Pregnancy Science, Progesterone Deficiency Syndromes, Pattern Formation, Positional Informatics, Primitive Streak. French flag problem; Growth and Differentiation, Embryonal/Homeobox genes, Embryonal growth factors, Oncogenes, Morphogenesis, Histogenesis, and Histodifferentiation. Principle of Teratogenesis, Experimental Teratogenesis, and Mechanism of Teratogenesis. All or none rule, drugs and first, second and third semesters of pregnancy. Common Teratogens, Congenital Anomalies, Biological Contraception and Contragestion.

ANA 806 Research Methods and Biostatistics (3 Units)
Definitions, types of research. Preparatory stages: Literature search, protocol development, sampling. Methods for the acquisition of data. Basics of data processing. Report/manuscript presentation. Human and animal ethical issues. Principles and applications of Statistical methods in Biomedical investigations including normal distribution, analysis of data-histograms, graphs, Pi graphs etc. test for Significance, T test (Paired and Unpaired), Analysis of Variance, Scattergrams and Regression analysis.

ANA 807 Advanced Histology and Histochemistry (3 Units)
Introduction to Histochemistry, Histochemical Tissue processing, Cryotomy, Histochemistry of Carbohydrates, Histochemistry of Proteins and Lipids, Histochemistry of Nucleic Acids, Histochemistry of Pigments and Minerals, Enzyme Histochemistry, Quantitative Histochemistry, Cytochemistry, Electron Cytochemistry, Diagnostic Histochemistry, Immunohistochemistry, APUD, Clinical cytochemistry, APUDOMAS, Brain-gut Peptides, Biogenic Amines, In situ hybridization Histochemistry, Cell Membrane concepts, Cellular Organelles I, Cellular Organelles II, Cellular Biophysics, Cellular Endocrinology, Ultrastructure of Developing Cells, Ultrastructure of Reproductive cells, Ultrastructure of Cardiovascular cells, Ultrastructure of Muscular cells, Ultrastructure of Neuron, Quantitative Micrography and Stereology.

ANA 808 Seminar (3 Units)

Seminar topics on current trends in anatomy and area of specialization.

ANA 809 Introductory Neuroscience (2 Units)
Overview of the nervous system: Genetics, Genomics and the brain, Components and overall organization of the nervous system, Neuroanatomical terminology, Subdivisions of the central nervous system, Organizational principles of neural systems, Functional analysis of neural systems, Analysing complex behaviour, Brain imaging techniques, Biological basis of learning and memory, Brain and behaviours, Behavioural techniques in neuroscience, Neuroscience of movement, Neuroscience of sleep and wakefulness, Neuroscience of hunger and thirst.

ANA 810 Reproductive Biotechnology (3 Units)
Advanced concepts in Reproductive Technologies, Causes of infertility in male and female, History of Assisted Reproductive technology, Sperm (Andrology) technologies: Semen Analysis, Semen Analysis Using Computer Assisted Semen Analyzer (CASA), Semen preparation methods, Assisted conception, Cryopreservation of Semen, Thawing of Semen, Semen function tests, Oocyte (Embryology) technologies: Oocyte identification/ pick up, Culture media, Assessment of fertilization, Embryo culture, Oocyte and Embryo grading, Blastocyst grading, In Vitro Fertilization (IVF), Intracytoplasmic Sperm Injection (ICSI), Embryo transfer, Assisted Hatching, Cryopreservation and Thawing of Embryo, Environment of early Embryo- Oviduct; Oviductal technologies, Introduction to some In vitro fertilization (IVF) equipment's and maintenance, Cloning and its debate, Estrous cycle, Surrogate pregnancy and its debates, Preimplantation genetic diagnosis, Ethical issues of assisted Reproductive Technologies, Twinning multiple births, Premature parturition, Stem cell culture and transplanting.

ANA 811 Endocrinology (3 Units)
Introduction and basic principles of endocrinology. Nature of hormones, synthesis, release and transport, Measurement and mechanisms of hormone action, control of Endocrine system. The Pituitary gland. The thyroid gland. The parathyroid gland and mineral homoestasis. The endocrine pancreas, the adrenal gland. Classification of hormones. Molecular mechanisms of hormonal action. The pituitary and hypothalamic hormones. Thyroid hormones; hormones regulating calcium metabolism. Hormones of the adrenal cortex and adrenal medulla. Hormones of the gonads, the pancreas, and the gastrointestinal hormones. Deficiency diseases of hormones. Principles of hormonal assay.

ANA 812 Advanced Histology of the Reproductive System (2 Units)
The male reproductive system: testes, intratesticular genital ducts, excretory genital ducts, accessory genital glands, penis. The female reproductive system: ovaries, oviducts, uterus, vagina, exfoliatory cytology, external genitalia, endocrine interrelationship, mammary glands.

ANA 813 Comparative Mammalian Anatomy (3 Units)
Animal kingdom, Invertebrates I, Invertebrates II, Invertebrates III, Fishes, Amphibians, Reptiles, Birds, Mammalogy, Vertebrate taxonomy, Development of bipedalism/locomotor apparatus, Development of amnionta, Comparative Neuroanatomy of Brain, Placentation, Speech and Phonation, Skull, Evolutionary theory, Comparative Anatomy of Vertebrate muscular system, Comparative Anatomy of Vertebrate skeletal system, Comparative Anatomy of Vertebrate gastrointestinal system, Comparative Anatomy of Vertebrate cardiovascular system, Comparative Anatomy of Vertebrate respiratory system, Comparative Anatomy of Vertebrate urinary system, Comparative Anatomy of Vertebrate reproductive system.

ANA 814 Advanced Neuroscience (3 Units)
Neural Signalling: Electrical signalling in neurons, Voltage dependent-membrane permeability, Channels and transporters, Synaptic transmission, Neurotransmitters and their receptors, Molecular signalling within neurons; *The Changing Brain:* Early brain development – gastrulation, neurulation, neural induction, altered brain development, Neurogenesis – neurons and glia differentiation, neuronal birth-dating, Generation of neuronal diversity, Neuronal Migration, Constructing the neural circuit, Experiential modification of brain circuits, Synapse and circuits plasticity; Neurochemical basis of behaviour, Computational neuroscience, Translational neuroscience, Molecular neuroscience, Neural basis of vision, Neural basis of cognition.

ANA 815 Forensic Science (2 Units)
History and Development of Forensic Science, Branches of Forensic Science, The Bertillon's system, Locard's Principle of Exchange, Biological Evidences, Division and Organisation of Forensic Laboratory, Functions of a Forensic scientist, Current trends in

Forensic science. Forensic Medicine, Introduction to techniques dealing with human remains within the legal frame work.

ANA 816 Biology of Neurological Disorders (2 Units)

Cell biology of the nervous system, Overview of neurological disorders, Biological mechanisms of neurological disorders, Neuroinflammation, Apoptosis, Neuropathology, structural, and neurochemical deficit in neurodevelopmental and neurodegenerative diseases, Neurobiology of Aging and mental health disorders, Addiction, Animal models for neurological disorders, Biological markers for neurological disorders.

ANA 817 Microscopic Techniques (2 Units)

The principles and techniques for the use of light microscopes will be taught and demonstrated i.e Fluorescent microscope, Phase contrast microscope, Dark-field microscope, Bright-field microscope, Polarizing microscope, Confocal microscope, Interference microscope, Ultraviolet microscope. Principles of Electron Microscopy, Electron Microscopic tissue processing, Ultramicrotomy, Staining procedures in electron microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy, Heteroduplex mapping.

ANA 818 Mortuary Science and Funeral Directing (2 Units)

Theories and principles of embalming. Offers an intensive study of the fundamentals of the embalming process; covers the purpose of embalming, modes of death, signs of death, expert tests for death, post-mortem physical and chemical changes, ethics of embalming, and laws of decomposition. Introduction to Restorative art. Funeral service orientation. History and sociology of funeral service. Descriptive pathology relevant to the work of a mortician, pathologist, coroner, and medical examiner. Introduction to funeral service laws and management. Advances and current trends in Embalming and Mortuary Science.

ANA 820 Forensic Anthropology (3 Units)

What is Anthropology? Evolution and Anthropology, Physical characteristics in man, Genetics of Populations, Hominoids, Hominids, Modern man, Paleoanthropology, Anthropometry, Human races, Social Anthropology, Cultural Anthropology, Religious Anthropology, Medical Anthropology, Clinical Anthropology, Advanced Evolution of man, and Practical Clinical Anthropology. Introduction to Forensic Anthropology, The Human Skeleton, Human vs. Nonhuman, Contemporary vs. Old, Estimating Time Since Death, Determination of Sex, Determination of Ancestry, Determination of Age at Death; Subadult and Adult, Determination of Stature & Handedness, Antemortem Skeletal Conditions/Pathology, Positive Identification, Overview of Skeletal Trauma/ Fractures, Projectile Trauma, Blunt Force & Sharp Force Trauma, Postmortem Changes.

ANA 822 Surface and Living Anatomy (2 Units)

Surface anatomy of the thoracic wall skeleton, Surface anatomy of the thoracic wall musculature and breast, Surface anatomy of the pleura and lungs, Surface anatomy of the anterolateral abdominal wall, Surface anatomy of the stomach, Surface anatomy of the spleen and pancreas, Surface anatomy of the kidneys and ureters, Surface anatomy of the abdominal aortas.

ANA 824 Radiological Anatomy (3 Units)

Introduction to Radiological, Radiation Physics and Genetics, Imaging modalities in anatomy, X-Ray, Fluoroscopy, Thermography, Xerography, Historadiology, Mammography, Ultrasonography, Tomography, and CAT scan, NMR, PET, Introduction to Radiology and Radiography, Positions for radiological imaging, Normal flat x-Ray plates, Contrast studies in radiological imaging, Ultrasounds in imaging anatomy, CAT Scanning imaging, NMR, and PET in imaging Anatomy.

ANA 899 Master's Research Project and Thesis (12 Units)

An original relevant research work in any of the areas of specialization is to be chosen by the student, under the direction of a supervisor(s). Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated time schedule of completion, and resources needed. The proposal will be presented via an oral seminar and approved by the Department prior to commencement of the project. Each candidate is required to prepare a thesis, which represents the report of the study, in an effectively organized and well-written format. The candidate is also required to present a final oral presentation on the project prior examination by the approved board of examiners.

CURRICULUM FOR DOCTOR OF PHILOSOPHY IN ANATOMY

1. PROGRAMME OFFERED
Doctor of Philosophy (PhD)

2. AVAILABLE OPTIONS/SPECIALISATION
a) Reproductive Biology
b) Neurobiology
c) Anthropology and Forensic Anatomy
d) Applied Anatomy and Medical Imaging

3. PROGRAMME PHILOSOPHY
The PhD in Anatomy is a research degree focused on producing postgraduate candidates of high academic standing with adequate practical exposure to function at the cutting edge of academia, industry, and government. Students are expected to exhibit scientific excellence towards the expounding and execution of a well-conceptualized research project that contributes novel knowledge to the state of the field. The degree will provide students the opportunity to develop skills and techniques that can leverage on interdisciplinary, multidisciplinary, and transdisciplinary approaches towards provided contemporary solutions to human health challenges. Students are prepared to be able to function well in the various areas of medical anatomy, complement ancillary laboratory biomedical services to the greater society and develop entrepreneurial expertise in related disciplines. It is also aimed at producing potential medical scientists to meet the dire needs for personnel in the basic medical sciences in universities, health institutions, research institutes as well as the Ministry of Health. It is also to produce specialists to work with local, state, and federal health agencies, environmental protection and ecology-oriented agencies, occupational health programmes, hospitals / clinics, and environmental consulting firms.

4. PROGRAMME OBJECTIVES
The general objectives of the PhD in Anatomy are to train highly qualified biomedical researchers for the realization of society's health needs and aspirations vis-a-vis industrial development and technological innovation.

The specific objectives of the programme are to:

a) equip graduates of the program with the relevant skills, techniques, and competencies necessary to drive high impact biomedical research towards improved health nationally and globally;
b) train highly skilled manpower for the needed didactic and education needs of the human anatomy programme in Nigeria;
c) provide and promote relevant theoretical and practical training in Anatomy Pedagogy, Clinical Anatomy, Neurobiology, Forensic Sciences, Anthropology and Anthropometry, Medical Imaging, Histopathological Anatomy, Developmental Biology, Endocrinology and Reproductive Biology, Molecular Biology and Medical Genetics;
d) train Anatomy personnel that can function effectively in the basic medical, medical, and allied health and biomedical establishments and those of other related disciplines; and
e) provide graduates with specialist and professional capacity hugely relevant to health agencies at local, state, and federal levels, environmental- and ecology-oriented agencies and firms, occupational health fields, hospitals, and clinics.

5. JUSTIFICATION FOR THE PROGRAMME
The Anatomy discipline is a core area in the biomedicine hence the need for specialist anatomy training on relevant knowledge and technical capacity in that is hugely beneficial to educational, medical and allied institutions, industries, health establishments, and public service. Graduates of the PhD Anatomy programme can contribute to technological and economic development of Nigeria and are motivated towards and engaged in continuous professional development, through individual efforts and advanced professional education.

6. ADMISSION REQUIREMENTS:
The requirements for admission into the PhD programme consist of:

i. M.Sc. or M.Tech. Degrees in Anatomy from the Federal University of Technology, Akure, or other recognized University with a CGPA of not less than 3.5 on a 5-point credit scale or a minimum overall score of 60%; or
ii. Candidates also possessing good M. Phil. Degree in Human Anatomy are also eligible.

Note: *Entry exams and/or interviews shall be conducted for prospective candidates to the PhD programmes with due permission from the School of Postgraduate Studies.*

7. PROGRAMME DURATION

a) Full-time PhD programme shall normally run for a duration of 36 – 48 months.
b) Part-time PhD programme shall normally run for a duration of 48 – 60 months.

8. GRADUATION REQUIREMENTS

The PhD programme is by research. Students will conceive and design a suitable original research project in consultation with a supervisor(s). The project will be approved by the Department Postgraduate Committee. To be eligible for the award of the award of the Ph.D Degree in Anatomy, a candidate must have:

a) successfully presented at least three seminars on the project (proposal, progress and final) in the Department;
b) present evidence of at least two (2) published articles reputable and relevant journals to the School of Postgraduate Studies of the University; and
c) successfully completed and defended a research thesis in an oral examination by a Panel of Examiners.

COURSE OUTLINE

ANA 999 Doctoral Thesis and Research Project

An original research project, which must involve independent investigations in any of the options, should make new and significant contributions to the basic medical sciences. The report should be presented in the form of a thesis using an approved format. The thesis shall be defended in an open oral examination organized by the School of Postgraduate Studies.

LIST OF ACADEMIC STAFF IN HUMAN ANATOMY DEPARTMENT (HUA)

S/N	NAME	STATUS	SPECIALIZATION
1	Prof. A. O. Lawal	Proffessor	Molecular Biology/Genetics, Biochemistry
2	Prof. V. O. Ukwenya	Professor	Reproductive Anatomy, Endocrinology
3	Dr. T. S. Olawuyi	Snr. Lecturer	Reproductive Endocrinology and Developmental Biology
4	Dr. B. Ogunlade	Snr. Lecturer	Neurobiology and Musculoskeletal Anatomy
5	Dr. B. K. Akinola	Lecturer I	Specialization: Radiological Anatomy and Forensic Anthropology.
6	Dr. S. A. Adelakun	Lecturer I	Reproductive Anatomy and Neuroendocrinology
7	Dr. B. O. Ibitoye	Lecturer I	Reproductive Neuroendocrinology

DEPARTMENT OF PHYSIOLOGY

CURRICULUM FOR MASTER OF SCIENCE (M.Sc.) PROGRAMME

1. PROGRAMME OFFERED
Master of Science (M.Sc.)

2. AVAILABLE OPTIONS/SPECIALIZATION

(a) Cardiopulmonary physiology;
(b) Metabolism, Endocrinology and Reproductive Physiology;
(c) Gastrointestinal Physiology;
(d) Neurophysiology

3. PROGRAMME PHILOSOPHY:
The M.Sc Physiology degree programme will be by course work and research activities in various areas of Physiology. In the first year of the M.Sc. programme, which consists of two semesters, students are expected to complete the compulsory and/or elective courses to be eligible to start their M.Sc. dissertation in the first semester of the second year. Each course is assessed based on a written continuous assessment and final examination at the end of the semester.

The candidates will independently carry out research for the M.Sc Physiology degree programme under the supervision of members of staff of the Department. The programme is designed to extend the frontiers of knowledge and make meaningful contributions, particularly in Cardiovascular, Endocrinology/Metabolism, Reproduction, and Gastrointestinal health and diseases. Through the M.Sc. programme much-needed research and personnel are required for the development and improvement of the health of the community.

At the end of their training, M.Sc. graduates of the programme will be conversant and comfortable in applying the acquired knowledge in their field to participate in and conduct innovative research in physiology toward solving the various pathological problems when human physiology is altered.

4. PROGRAMME OBJECTIVES
The objectives of the programme are to:
(a) provide candidates with adequate training on current research and methodological techniques particularly in the areas of Cardiovascular, Endocrinology and Metabolism, Reproductive toxicology, Gastrointestinal, and Neuroscience;
(b) provide and promote sound research skills and culture in various areas of Physiology, which includes training students that can carry out independent research and critical thinking; and
(c) train candidates to develop skills in critical analysis of current research in various areas of Physiology.

5. PROGRAMME JUSTIFICATION
The growing need for improvement of our health care system can only be met through adequate training of researchers in the Basic Medical Sciences including Physiology. The M.Sc. The Physiology Programme will train researchers in Basic Medical Sciences. Graduates of the programme will be sufficiently trained/prepared for admission into Ph.D. programmes in Physiology in local and foreign institutions. Graduates of the programme will also contribute to the economic development of Nigeria through improvement in medical research and health care delivery.

6. ADMISSION REQUIREMENTS:
Candidate must satisfy the general regulations governing postgraduate studies at The Federal University of Technology, Akure. In addition, the following Departmental requirements must be satisfied: B.Sc. or B.Tech in Physiology from the Federal University of Technology, Akure, or any other recognized University with at least a Second Class Honours (Lower Division). In addition, candidates with MBBS, BDS, and Doctor of Veterinary Medicine (DVM) are also eligible. Candidates with Bachelor's degrees in other allied Health Sciences may be considered subject to satisfactory assessment.

7. PROGRAMME DURATION
The M.Sc. programme shall be for a minimum period of 18 – 24 months. The first two semesters shall be for coursework and examinations. The third semester shall be for a dissertation based on a research proposal submitted and approved at the end of the second semester.

8. GRADUATION REQUIREMENTS
To be eligible for the award of the Master of Science (M.Sc.) degree in Physiology, a candidate must have:
(a) passed all the compulsory courses and relevant electives recommended by the Department for the approved area of specialization;
(b) successfully presented a seminar: proposal and progressive seminars;

(c) fulfilled all other conditions as prescribed by the Board of the School of Postgraduate Studies of the University;
(d) successfully defended a research thesis in an oral examination by a Panel of Examiners; and
(e) guidance of submission of one manuscript for publication.

9.0 COURSE OUTLINE

9.1 M.Sc. IN CARDIOPULMONARY PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 801	Autonomic Nervous System Pharmacology	2	0	0	2
2.	PHS 803	General Principles of Physiology	2	0	0	2
3.	PHS 805	Instrumentations and Techniques in Physiology and Pharmacology	2	0	0	2
4.	PHS 807	Research Methodology and Biostatistics	3	0	0	3
5.	PHS 809	Endocrine Physiology	3	0	0	3
6.	PHS 811	Molecular Techniques in Physiology	2	0	3	3
		TOTAL				**15**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 802	Neurophysiology	3	0	0	3
2.	PHS 804	Respiratory Physiology	3	0	0	3
3.	PHS 808	Renal Physiology and Body Fluids	3	0	0	3
4.	PHS 814	Cardiovascular Physiology	3	0	0	3
5.	PHS 824	Seminars in Physiology	2	0	0	2
		TOTAL				**14**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 899	Master's Thesis Research Project	0	0	36	12
		TOTAL				**12**

9.2 M.Sc. IN METABOLIC, ENDOCRINOLOGY AND REPRODUCTIVE PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 801	Autonomic Nervous System Pharmacology	2	0	0	2
2.	PHS 803	General Principles of Physiology	2	0	0	2
3.	PHS 805	Instrumentations and Techniques in Physiology and Pharmacology	2	0	0	2
4.	PHS 807	Research Methodology and Biostatistics	3	0	0	3
5.	PHS 809	Endocrine Physiology	3	0	0	3
6.	PHS 811	Molecular Techniques in Physiology	2	0	3	3
		TOTAL				**15**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 802	Neurophysiology	3	0	0	3
2.	PHS 806	Gastrointestinal Physiology	3	0	0	3
3.	PHS 810	Reproductive Physiology	3	0	0	3
4.	PHS 816	Environmental Physiology	3	0	0	3
5.	PHS 824	Seminars in Physiology	2	0	0	2
		TOTAL				**14**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 899	Master's Thesis Research Project	0	0	36	12
		TOTAL				**12**

9.3 MASTERS (M.Sc.) IN GASTROINTESTINAL PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 801	Autonomic Nervous System Pharmacology	2	0	0	2
2.	PHS 803	General Principles of Physiology	2	0	0	2
3.	PHS 805	Instrumentations and Techniques in Physiology and Pharmacology	2	0	0	2
4.	PHS 807	Research Methodology and Biostatistics	3	0	0	3
5.	PHS 809	Endocrine Physiology	3	0	0	3
6.	PHS 811	Molecular Techniques in Physiology	2	0	3	3
					TOTAL	15

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 802	Neurophysiology	3	0	0	3
2.	PHS 806	Gastrointestinal Physiology	3	0	0	3
3.	PHS 812	Nutrition and Metabolism	3	0	0	3
4.	PHS 816	Environmental Physiology	3	0	0	3
5.	PHS 824	Seminars in Physiology	2	0	0	2
					TOTAL	14

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 899	Master's Thesis Research Project	0	0	36	12
					TOTAL	12

9.4 MASTERS (M.Sc.) IN NEUROPHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 801	Autonomic Nervous System Pharmacology	2	0	0	2
2.	PHS 803	General Principles of Physiology	2	0	0	2
3.	PHS 805	Instrumentations and Techniques in Physiology and Pharmacology	2	0	0	2
4.	PHS 807	Research Methodology and Biostatistics	3	0	0	3
5.	PHS 809	Endocrine Physiology	3	0	0	3
6.	PHS 811	Molecular Techniques in Physiology	2	0	3	3
					TOTAL	15

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 802	Neurophysiology	3	0	0	3
2.	PHS 804	Environmental Physiology	3	0	0	3
3.	PHS 818	Physiology of Special Senses	3	0	0	3
4.	PHS 822	Higher Intellectual Functions and Behavioural Neuroscience	3	0	0	2
5	PHS 824	Seminars in Physiology	2	0	0	2
					TOTAL	14

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 899	Master's Thesis Research Project	0	0	36	12
					TOTAL	12

10. MASTER OF SCIENCE (M.Sc.) COURSE SYNOPSES

PHS 801 Autonomic Nervous System Pharmacology (2 Units)

Drugs affecting the autonomic nervous system (ANS) - Overview, Introduction to the Nervous System, Chemical Signaling between Cells, Second–Messenger Systems in Intracellular Response. Cholinergic-agonists - The Cholinergic Neuron, Neurotransmission at cholinergic neurons. Cholinergic Receptors (Cholinoceptors) - Muscarinic receptors and nicotinic receptors. Direct-acting Cholinergic Agonists – Acetylcholine, Bethanechol, Carbachol (carbamylcholine), Pilocarpine. Indirect-Acting Cholinergic Agonists: Acetylcholinesterase Inhibitors (Reversible) – Edrophonium, Physostigmine, Neostigmine, Pyridostigmine and ambenonium, Tacrine, donepezil, rivastigmine, and galantamine. Indirect-Acting Cholinergic Agonists: Anticholinesterases (Irreversible) – Echothiophate. Toxicology of Acetylcholinesterase Inhibitors. Cholinergic antagonists. Antimuscarinic Agents – Atropine, Scopolamine. Ganglionic Blockers, Neuromuscular-Blocking Drugs, Adrenergic Agonist – Overview, The Adrenergic Neuron, Direct-Acting Adrenergic Agonists, Indirect-Acting Adrenergic Agonists, Mixed-Action Adrenergic Agonists, Adrenergic antagonists, α-Adrenergic Blocking Agents, β-Adrenergic Blocking Agents, Drugs Affecting Neurotransmitter Release or Uptake,

PHS 802 Neurophysiology (3 Units)

Central Nervous System - Organization, structure of spinal cord. Sensory receptors and receptor adaptation. Synaptic transmission and properties. Neurotransmitters. Spinal reflexes (monosynaptic and polysynaptic). Ascending sensory pathways. Thalamic nuclei. Cerebral cortex-sensory, motor, association areas. Corticospinal (Pyramidal) tract. Basal ganglia and functions. Reticular system and ARAS. Imaging techniques of the brain, CT-scan, MRI, and Positron Emission Tomography (PET). Evoked potentials. Cerebellum functions. Higher functions of the brain-memory, speech, sleep, and Electroencephalogram (EEG). Autonomic Nervous System - Sympathetic and Parasympathetic. Neurotransmitters, functions, receptor sub-types. Pain, Headache, and Thermal Sensations, Types of Pain and Their Qualities— Fast Pain and Slow Pain, Pain Receptors and Their Stimulation Dual Pathways for Transmission of Pain Signals into the Central Nervous System, Dual Pain Pathways in the Cord and Brain Stem—The Neospinothalamic Tract and the Paleospinothalamic Tract. Pain-suppression ("Analgesia") System in the Brain and Spinal Cord, Referred Pain, Visceral Pain. Some Clinical Abnormalities of Pain and Other Somatic Sensations. Headache, Thermal Sensations. States of Brain Activity—Sleep, Brain Waves, Epilepsy, Psychoses, The Autonomic Nervous System and the Adrenal Medulla, Cerebral Blood Flow, Cerebrospinal Fluid, and Brain Metabolism.

PHS 803 General Principles of Physiology (2 Units)

Functional Organization of the Human Body and Control of the "Internal Environment" Cells as the Living Units of the Body, Extracellular Fluid—The "Internal Environment" "Homeostatic" Mechanisms of the Major Functional Systems Homeostasis. Control Systems of the Body, Examples of Control Mechanisms, Characteristics of Control Systems. The Cell and Its Functions, Organization of the Cell, Physical Structure of the Cell, Membranous Structures of the Cell, Cytoplasm and Its Organelles, Nucleus, Nuclear Membrane, Nucleoli and Formation of Ribosomes, Comparison of the Animal Cell with Precellular Forms of Life, Functional Systems of the Cell, Ingestion by the Cell—Endocytosis, Digestion of Pinocytotic and Phagocytic Foreign Substances Inside the Cell—Function of the Lysosomes, Synthesis, and Formation of Cellular Structures by Endoplasmic Reticulum and Golgi Apparatus, Extraction of Energy from Nutrients—Function of the Mitochondria, Locomotion of Cells, Ameboid Movement, Cilia and Ciliary Movement. Genetic Control of Protein Synthesis; Cell Function, and Cell Reproduction, Genes in the Cell Nucleus, Genetic Code. Control of Gene Function and Biochemical Activity in Cells, Genetic Regulation, Control of Intracellular Function by Enzyme Regulation, The DNA-Genetic System Also Controls Cell Reproduction, Cell Reproduction Begins with Replication of DNA, Chromosomes and Their Replication, Cell Mitosis, Control of Cell Growth and Cell Reproduction, Cell Differentiation, Apoptosis—Programmed Cell Death, Cancer

PHS 804 Respiratory Physiology (3 Units)

Mechanisms of Respiration. Work of breathing. Surfactant. Pulmonary circulation and hypoxic pulmonary vasoconstriction. Gas exchange in the lungs and Gas transport by blood. Fetal hemoglobin. Chemical and Neural Control of Respiration. Respiratory responses to exercise, altitude, deep sea diving, space travel, artificial respiration.

PHS 805 Instrumentation and Techniques in Physiology and Pharmacology (3 Units)
Principles of Electronics and Integrated Circuits. Calibration of equipment - Reliability. Sensitivity and Reproducibility. Fault detection and troubleshooting. Basic measuring instruments - principles of action of selected basic instruments, ICT methods, and use. Techniques applied for pharmacological activities and mechanisms.

PHS 806 Gastrointestinal Physiology (3 Units)
General Principles of Gastrointestinal Function—Motility, Nervous Control, and Blood Circulation, Functional Types of Movements in the Gastrointestinal Tract, Gastrointestinal Blood Flow— "Splanchnic Circulation", Gastrointestinal motility. Secretory Functions of the GI Tract - Secretion of Saliva, Gastric Secretion, Pancreatic Secretion, Secretion of Bile by the Liver; Functions of the Biliary Tree, Secretions of the Small Intestine, Secretions of the Large Intestine, Digestion and Absorption in the Gastrointestinal Tract, Digestion and Absorption in the Gastrointestinal Tract, Physiology of Gastrointestinal Disorders.

PHS 807 Research Methodology and Biostatistics (2 Units)
The principles of research, Searching the published and unpublished literature, Systematic literature reviews, Systematic qualitative reviews, Meta-analyses, Critical appraisal, Evidence-based practice, Rigour in conducting research, Aims, objectives, and hypotheses, Concepts and theories, Research proposals, Research design and research methods, Selection of measurement instruments, Level of data and statistical techniques, Levels of data, parametric and non-parametric statistics, Reliability and validity, Threats to reliability and validity, Ethics and ethical committees, Dissemination. Calculation of sample size, statistical significance, and sampling, The sampling unit, Calculation of sample size and statistical power, Testing hypotheses, statistical significance, the null hypothesis, Type I and type II errors, One- or two-sided hypothesis testing, Statistical, social and clinical significance, Sampling frames, Sampling, Confidence intervals and the normal distribution. Sample size and sampling for quantitative and qualitative research, experiments and other analytic methods, Sample selection and group assignment methods in experiments and other analytic methods, Data collection methods in quantitative research: questionnaires, interviews and their response rates, Questionnaire design, Preparation of quantitative data for coding and analysis, Mixed research approaches, Handling of laboratory animals. Ethical clearance in human experimental studies and use of laboratory animals.

PHS 808 Renal Physiology (3 Units)
Body Fluid Compartments, Constituents of Extracellular and Intracellular Fluids, Measurement of Fluid Volumes in the Different Body Fluid Compartments, Basic Principles of Osmosis and Osmotic Pressure, Edema: Excess Fluid in the Tissues, The Kidneys, Renal Clearance, Renal Blood Flow (RBF), and Glomerular Filtration Rate (GFR). Determinants of the GFR, Autoregulation of GFR and Renal Blood Flow, Urine Formation - Glomerular Filtration, Tubular Reabsorption, and Tubular Secretion, NaCl Regulation, K^+ Regulation, Renal Regulation of Urea, Phosphate, Calcium, and Magnesium, Concentration and Dilution of Urine, Renal Hormones, Acid–Base Balance, Diuretics. Micturition, Physiologic Anatomy and Nervous Connections of the Bladder, Transport of Urine from the Kidney Through the Ureters and into the Bladder, the Cystometrogram, Micturition Reflex, Abnormalities of Micturition.

PHS 809 Endocrinology (3 Units)
Coordination of Body Functions by Chemical Messengers, Chemical Structure and Synthesis of Hormones, Hormone Secretion, Transport, and Clearance from the Blood, Feedback Control of Hormone Secretion, Transport of Hormones in the Blood, "Clearance" of Hormones from the Blood, Mechanisms of Action of Hormones, Hormone Receptors and Their Activation, Intracellular Signalling After Hormone Receptor Activation, Second Messenger Mechanisms for Mediating Intracellular Hormonal Functions, Hormones that Act Mainly on the Genetic Machinery of the Cell, Measurement of Hormone Concentrations in the Blood, Radioimmunoassay, Enzyme-Linked Immunosorbent Assay (ELISA). Concept of second messenger and signaling systems; protein kinases; IP3, G-proteins, etc. Hypothalamus-Pituitary axis and hormones. Hormonal actions of endocrine glands - Thyroid. Parathyroid, Adrenal cortex, and Medulla including Renin Angiotensin Aldosterone System (RAAS). Pancreas. The pineal gland and diurnal rhythm. The Prostaglandins.

PHS 810 Reproduction (3 Units)
Gonads. Sex determination and differentiation. Male and Female reproductive systems. Assessment of infertility. Hypothalamic–pituitary influence. Menstrual cycle. Pregnancy and Lactation. Gonadal and placental hormones. Puberty and Menopause. Fetal Circulation. Fetal and Neonatal Physiology - Growth and Functional

Development of the Fetus, Adjustments of the Infant to Extrauterine Life, Special Functional Problems in the Neonate, Special Problems of Prematurity.

PHS 811 Molecular Techniques in Physiology (3 Units)
SDS Page, Protein expression, DNA, RNA, Genetics and Genomics. Membrane structure and genetic control. Cellular messengers. Stem cell research. Knockout and transgenic mice. Recombinant DNA, Polymerase Chain Reaction (PCR), Northern Blot, Western Blot techniques. The Human genetic project/genome. Nanotechnology and targeted drug delivery.

PHS 812 Nutrition and Metabolism (2 Units)
Aims of nutrition Energy content of food - Carbohydrates, protein, fats, Basal metabolic rate. Calorie requirements per day. Estimation of obesity e.g. Body Mass Index (BMI). Vitamins and mineral requirements and functions. Metabolism of Carbohydrates, and Formation of Adenosine Triphosphate - Release of Energy from Foods, and the Concept of "Free Energy", Role of Adenosine Triphosphate in Metabolism, Central Role of Glucose in Carbohydrate Metabolism, Transport of Glucose Through the Cell Membrane, Phosphorylation of Glucose, Muscle, Glycogenesis—The Process of Glycogen Formation, Removal of Stored Glycogen — Glycogenolysis, Release of Energy from the Glucose Molecule by the Glycolytic Pathway, Release of Energy from Glucose by the Pentose Phosphate Pathway, Formation of Carbohydrates from Proteins and Fats—"Gluconeogenesis", Blood Glucose, Lipid Metabolism, Transport of Lipids in the Body Fluids, Use of Triglycerides for Energy: Formation of Adenosine Triphosphate, Regulation of Energy Release from Triglycerides, Phospholipids, and Cholesterol. Protein Metabolism, Transport and Storage of Amino Acids, Functional Roles of the Plasma Proteins, Hormonal Regulation of Protein Metabolism, Metabolic Functions of the Liver, Vitamins, Mineral Metabolism, Energetics and Metabolic Rate.

PHS 814 Cardiovascular Physiology (3 Units)
Components and Functions of the Cardiovascular System: The heart and; the blood vessels, Cardiac and vascular smooth muscle physiology, Pulmonary and systemic circulations, Blood flow, The Heart's Electrical Conduction System, Heartbeat Coordination, Sequence of Excitation, Cardiac Action Potentials and Excitation of the SA Node, The Standard 12-Lead Electrocardiogram, Excitation–Contraction Coupling, Refractory Period of the Heart, Mechanical Events of the Cardiac Cycle, Heart Sounds, Cardiac Output, Venous return, Stroke volume, Heart rate**,** Arterial Blood Pressure and Hypertension, Regulation of Arterial blood Pressure, Baroreceptor reflex, Other cardiovascular reflexes, Renin-angiotensin-aldosterone system, Regional circulations, Coronary circulation, Splanchnic circulation, Cerebral circulation, Fetal circulation, Circulatory shock, Circulatory adjustment during exercise

PHS 816 Environmental Physiology (3 Units)
Current concepts on the control of energy balance. Review of intermediate metabolism of specific organs: brain, renal, pulmonary, and cardiac metabolism. Abnormal metabolism: diabetes mellitus, specific inborn errors of metabolism. Physiological basis of topical environmental problems, family planning, and malnutrition.

PHS 818 Physiology of Special Senses (3 Units)
The EYE: Structure and function, scotopic and photopic vision, color vision, accommodation, visual pathway, and pupillary light reflex. Errors and refraction and experiments on visual function. EAR: Auditory function hearing, deafness, auditory pathway, determination of loudness and pitch. SMELL: Physiology of olfaction, olfactory pathway. TASTE: Taste pathway and taste reflexes.

PHS 822 Higher Intellectual Functions and Behavioural Neuroscience (3 Units)
Learning and memory; Speech; Physiology of pain; Brain control of movement; The Resting Brain, Attention, and Consciousness; Brain Rhythms and Sleep- body temperature, alertness, and metabolism; Emotion; Mental Illnesses - psychiatric disorders: anxiety disorders, affective disorders, and schizophrenia; Cognitive Neuroscience of Memory and Perception**;** Animal models for evaluating various behavioral patterns, justifications, parameters, and endpoints

PHS 824 Seminars in Physiology (2 Units)
A selected topic in any area of physiology but of interest to the student for literature review presented as a report after oral presentation.

PHS 899 Dissertation (12 Units)
Research project on the candidate's area of interest presented in a report (Dissertation) examined orally before the panel of examiners.

Curriculum For Masters of Philosophy (M.Phil) in Physiology

1. PROGRAMME OFFERED: Master of Philosophy (M.Phil) in Physiology.

The available options / specializations include:

(i) cardiopulmonary physiology;
(ii) renal physiology;
(iii) metabolism and endocrine physiology;
(iv) reproductive physiology;
(v) gastrointestinal physiology;
(vi) neurophysiology; and
(vii) sports and exercise physiology.

2. PROGRAMME PHILOSOPHY

The M.Phil programme is designed to meet the research needs of the candidates with M.Sc or M.Tech, in Physiology. It is intended to foster the development of independent research skills to enhance their ability to proceed to the PhD degree programme. The M.Phil Physiology degree is mainly based on coursework and research activities. The candidates will independently carry out the research for M.Phil degree under the supervision of members of staff of the Department. The M.Phil programme is designed to give more basic research opportunities and more exposure to master-level coursework and seminars to the prospective candidates. The programme is also designed to extend the frontiers of knowledge, particularly in Cardiovascular, Respiratory, Endocrinology/Metabolism, Reproduction, Gastrointestinal, and Sports and Exercise, which are areas of intense research and application worldwide. Through this programme much-needed research and leadership personnel for academics, hospitals, medical facilities, institutions, government, and industries will be produced for national and international development.

3. PROGRAMME OBJECTIVES

The specific objectives of the programme are to:

a) expose candidates to current research and methodological techniques particularly in the Basic Medical Sciences which are areas of intense research and applications in industries, academia, medical institutions, and public and private sectors;

b) provide and promote sound practical and theoretical training in Cardiovascular, Respiratory, Endocrinology/ Metabolism, Reproduction, Gastrointestinal, Sports and exercise that will make the students useful in both private and public sectors of the economy. This will enable candidates to identify problems and proffer recommendations and strategies for their solutions as well as implementation strategies; and

c) develop in candidates the mastery of appropriate skills to articulate a critical analysis of advanced studies in Physiology.

4. PROGRAMME JUSTIFICATION

(a) The growing need of for improvement of our health care system can only be met through adequate training of researchers in the Basic Medical Sciences, including Physiology.

(b) Graduates in M.Phil Physiology will acquire advanced and specialized trainings to improve the quality of personnel in the medical and allied health institutions, industries, education, and in the public/private sectors;

(c) M.Phil graduates in Physiology will be adequately trained and prepared for admission into Ph.D programme in Physiology and relevant fields both in local and foreign institutions; and

(d) M.Phil graduates in Physiology will contribute to sound scientific discoveries, economic developments as well as Research and development (R&D) institutions and industries in Nigeria and beyond.

5. ADMISSION REQUIREMENTS

Candidates must satisfy the general regulations governing postgraduate studies at the Federal University of Technology, Akure. In addition, the following Departmental requirements must be satisfied:

(a) M.Sc. in Physiology from the Federal University of Technology, Akure with a minimum CGPA of 2.50 on a 5-point grading system or a minimum overall score of 50% in a Masters degree, or

(b) M.Sc., or M.Tech in Physiology from other recognized University with a with a minimum CGPA of 2.50 on a 5-point grading system, or its equivalent from recognized institution, or a minimum overall score of 50% in a Masters degree.

6. PROGRAMME DURATION

The M.Phil programme shall be full-time for a minimum period of 18 months and a maximum of 24 months. The

first two semesters shall be by course work and examinations. The third semester shall be by thesis based on a research proposal submitted and approved at the end of second semester.

7. GRADUATION REQUIREMENTS

To be eligible for the award of the M.Phil degree in Physiology, a candidate must have:

a) passed all the courses recommended by the Department for the approved area of specialization with at least a pass mark of 50% in the required courses;
b) successfully presented at least two research seminars: proposal and final seminars;
c) evidence of submission of at least one article during the course of the programme;
d) fulfilled all other conditions as prescribed by the Board of the School of Postgraduate Studies of the University; and
e) successfully defended a research thesis in an oral examination by a Panel of Examiners.

A candidate who obtains less than 50% or a CGPA of 3.5 on a 5-point credit scale shall not qualify for admission into the PhD programme and shall be awarded a Terminal M.Phil degree.

8 COURSE OUTLINE

8.1 M.Phil IN CARDIOPULMONARY PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine signaling	3	0	0	3
TOTAL						**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 860	Cardiorespiratory Physiology	3	0	0	3
		TOTAL				**6**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
		TOTAL				**6**

8.2 M.Phil. IN RENAL PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine signaling	3	0	0	3
		TOTAL				**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 862	Renal Physiology and Body Fluids	3	0	0	3
TOTAL						**6**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						**6**

8.3 M.Phil IN METABOLISM AND ENDOCRINE PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 861	Gastrointestinal Physiology	3	0	0	3
TOTAL						**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 864	Nutrition and Metabolism	3	0	0	3
TOTAL						6

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						6

8.4 M.Phil IN REPRODUCTIVE PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine signaling	3	0	0	3
TOTAL						6

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 866	Reproductive Physiology	3	0	0	3
TOTAL						6

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						6

8.5 M.Phil IN GASTROINTESTINAL PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 861	Gastrointestinal Physiology	3	0	0	3
TOTAL						6

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 868	Gut Microbiota and Metabolites	3	0	0	3
TOTAL						6

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						6

8.6 M.Phil IN NEUROPHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine signaling	3	0	0	3
TOTAL						6

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 870	Neurochemistry and Behavioral Neuroscience	3	0	0	3
TOTAL						6

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						6

8.7 M.Phil IN SPORTS AND EXERCISE PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine Signaling	3	0	0	3
TOTAL						6

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 872	Sports and Exercise Physiology	3	0	0	3
TOTAL						6

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						6

9. COURSE SYNOPSES

PHS 857 Project Report Writing and Grantsmanship (3 Units)

This course introduces the students to the preparation of reports for various purposes. Emphasis should be on different reasons for report writing, that is to present information such as a laboratory report or financial report, to present research findings, or to analyze a problem and then recommend a particular action or strategy; types of report (long or short, formal or informal). The style and vocabulary choice; emphasis should be on research and business report writing – the format, language style, and writing tips. Research funding opportunities and their requirements. Guide to writing a successful research grant proposal.

PHS 858 Seminars in Physiology (3 Units)

Selected topic in any emerging area of physiology but of interest to the student for literature review to be presented as a report after oral presentation.

PHS 859 Neuroendocrine Signaling (3 Units)

Coordination of Body Functions by Chemical Messengers, Chemical Structure and Synthesis of Hormones, Hormone Secretion, Transport, and Clearance from the Blood, Feedback Control of Hormone Secretion, Transport of Hormones in the Blood, "Clearance" of Hormones from the Blood, Mechanisms of Action of Hormones, Hormone Receptors and Their Activation, Intracellular Signalling After Hormone Receptor Activation, Second Messenger Mechanisms for Mediating Intracellular Hormonal Functions, Hormones that Act Mainly on the Genetic Machinery of the Cell, Measurement of Hormone Concentrations in the Blood, Radioimmunoassay, Enzyme-Linked Immunosorbent Assay (ELISA). Concept of second messenger and signaling systems; protein kinases; IP3, G-proteins etc. Hypothalamus-Pituitary axis and hormones. Hormonal actions of endocrine glands - Thyroid. Parathyroid, Adrenal cortex and Medulla including Renin Angiotensin Aldosterone System (RAAS). Pancreas. Pineal gland and diurnal rhythm. The Prostaglandins.

PHS 860 Cardiorespiratory Physiology (3 Units)

Components and Functions of the Cardiovascular System: The heart and; the blood vessels, Cardiac and vascular smooth muscle physiology, Pulmonary and systemic circulations, Blood flow, The Heart's Electrical Conduction System, Heartbeat Coordination, Sequence of Excitation, Cardiac Action Potentials and Excitation of the SA Node, The Standard 12-Lead Electrocardiogram, Excitation–Contraction Coupling, Refractory Period of the Heart, Mechanical Events of the Cardiac Cycle, Heart Sounds, Cardiac Output, Venous return, Stroke volume, Heart rate, Arterial Blood Pressure and Hypertension, Regulation of Arterial blood Pressure, Baroreceptor reflex, Other cardiovascular reflexes, Renin-angiotensin-aldosterone system, Regional circulations, Coronary circulation, Splanchnic circulation, Cerebral circulation, Fetal

circulation, Circulatory shock, Circulatory adjustment during exercise. Mechanisms of Respiration. Work of breathing. Surfactant. Pulmonary circulation and hypoxic pulmonary vasoconstriction. Gas exchange in the lungs and Gas transport by blood. Fetal hemoglobin. Chemical and Neural control of Respiration. Respiratory responses to exercise, altitude, deep sea diving, space travel, artificial respiration.

PHS 861 Gastrointestinal Physiology (3 Units)

General Principles of Gastrointestinal Function—Motility, Nervous Control, and Blood Circulation, Functional Types of Movements in the Gastrointestinal Tract, Gastrointestinal Blood Flow— "Splanchnic Circulation", Gastrointestinal motility. Secretory Functions of the GI Tract - Secretion of Saliva, Gastric Secretion, Pancreatic Secretion, Secretion of Bile by the Liver; Functions of the Biliary Tree, Secretions of the Small Intestine, Secretions of the Large Intestine, Digestion and Absorption in the Gastrointestinal Tract, Digestion and Absorption in the Gastrointestinal Tract, Physiology of Gastrointestinal Disorders, Gut microbiota and metabolism.

PHS 862 Renal Physiology and Body Fluids (3 Units)

Body Fluid Compartments, Constituents of Extracellular and Intracellular Fluids, Measurement of Fluid Volumes in the Different Body Fluid Compartments, Basic Principles of Osmosis and Osmotic Pressure, Edema: Excess Fluid in the Tissues, The Kidneys, Renal Clearance, Renal Blood Flow (RBF), and Glomerular Filtration Rate (GFR). Determinants of the GFR, Autoregulation of GFR and Renal Blood Flow, Urine Formation - Glomerular Filtration, Tubular Reabsorption, and Tubular Secretion, NaCl Regulation, K^+ Regulation, Renal Regulation of Urea, Phosphate, Calcium, and Magnesium, Concentration and Dilution of Urine, Renal Hormones, Acid–Base Balance, Diuretics. Micturition, Physiologic Anatomy and Nervous Connections of the Bladder, Transport of Urine from the Kidney Through the Ureters and into the Bladder, the Cystometrogram, Micturition Reflex, Abnormalities of Micturition.

PHS 864 Nutrition and Metabolism (3 Units)

Aims of nutrition Energy content of food - Carbohydrates, protein, fats, Basal metabolic rate. Calorie requirements per day. Estimation of obesity e.g. Body Mass Index (BMI). Vitamins and mineral requirements and functions. Metabolism of Carbohydrates, and Formation of Adenosine Triphosphate - Release of Energy from Foods, and the Concept of "Free Energy", Role of Adenosine Triphosphate in Metabolism, Central Role of Glucose in Carbohydrate Metabolism, Transport of Glucose Through the Cell Membrane, Phosphorylation of Glucose, Muscle, Glycogenesis—The Process of Glycogen Formation, Removal of Stored Glycogen — Glycogenolysis, Release of Energy from the Glucose Molecule by the Glycolytic Pathway, Release of Energy from Glucose by the Pentose Phosphate Pathway, Formation of Carbohydrates from Proteins and Fats—"Gluconeogenesis", Blood Glucose, Lipid Metabolism, Transport of Lipids in the Body Fluids, Use of Triglycerides for Energy: Formation of Adenosine Triphosphate, Regulation of Energy Release from Triglycerides, Phospholipids and Cholesterol. Protein Metabolism, Transport and Storage of Amino Acids, Functional Roles of the Plasma Proteins, Hormonal Regulation of Protein Metabolism, Metabolic Functions of the Liver, Vitamins, Mineral Metabolism, Energetics and Metabolic Rate

PHS 866 Reproductive Physiology (3 Units)

Gonads. Sex determination and differentiation. Male and Female reproductive systems. Assessment of infertility. Hypothalamic – pituitary influence. Menstrual cycle. Pregnancy and Lactation. Gonadal and placental hormones. Puberty and Menopause. Fetal Circulation. Fetal and Neonatal Physiology - Growth and Functional Development of the Fetus, Adjustments of the Infant to Extrauterine Life, Special Functional Problems in the Neonate, Special Problems of Prematurity.

PHS 868 Gut Microbiota and Metabolites (3 Units)

Gut microbiota composition and colonization of the gastrointestinal tract. Environmental influence on the gut microbiota. Gut microbiota metabolites. Gut microbiota signaling in the brain-gut-axis. Role of the gut microbiota in digestive function of the gastrointestinal tract. The role of gut microbiota in gut immunity, inflammation, and metabolic diseases (Obesity and diabetes).

PHS 870 Neurochemistry and Behavioral Neuroscience (3 Units)

Basic neurochemistry of the brain and nervous system complexity; Principles and concepts of the chemical and functional organization of the nervous system at the cellular and molecular levels; Structure and role of receptors in neurotransmission; Neurotransmitter systems and their functions in the brain - Acetylcholine,

Catecholamine, Serotonin, histamine and melatonin, Amino acid neurotransmitters, Neuropeptide, Atypical neurotransmitters; Synaptic, presynaptic proteins and cell adhesion molecule; Neurotransmitter synthesis; Neurons and neuronal communication; Neurochemical processes underlying brain states and diseases; Neurochemical substances and mechanisms underlying behavioral patterns and disorders; Critical reading of primary literature and presentation; Mental Illnesses - psychiatric disorders: anxiety disorders, affective disorders, and schizophrenia; Cognitive Neuroscience of Memory and Perception**;** Animal models for evaluating various behavioral patterns, justifications, parameters, and endpoints.

PHS 872 Sport and Exercise Physiology (3 Units)

Review of Behaviour of physiological process in response to physical effort. Structural basis of muscle contraction, neural control of muscle, and energetics of muscle contraction. Energy/fuel utilization, fatigue, physiological adjustment during exercise and influence of training. Review of muscle attachments and muscle action. Nerve supply and neurological control of movements. Location of the centres of gravity of the body. Biomechanisms of human motion. Fundamental standing positions/postures. Resolution of forces. Roles of muscle action. Types of body movements and uses. Introduction to electromyography studies. Analysis of normal and abnormal human locomotion; analysis of motor skill. All students of this course must visit and make a trip up Idanre hills in Idanre, Ondo State; measure comparative physiological parameters at the base versus top of the hills.

PHS 889 MPhil Project Dissertation (6 Units)

Research project on the candidate's area of interest presented in a report (Dissertation) examined orally before the panel of examiners.

Curriculum For Master/Doctorate of Philosophy (M.Phil/PhD) in Physiology

1. **PROGRAMME OFFERED:** Masters of Philosophy / Doctor of Philosophy (M.Phil/PhD) in Physiology

The available options/specializations include:

(i) cardiorespiratory physiology;
(ii) renal physiology;
(iii) metabolism and endocrine physiology;
(iv) reproductive physiology;
(v) gastrointestinal physiology;
(vi) neurophysiology; and
(vii) sports and exercise physiology.

2. **PROGRAMME PHILOSOPHY**

The M.Phil/Ph.D programme is designed to meet the research needs of the candidates with M.Tech, or M.Sc. in Physiology. It is intended to foster the development of independent research skills to enhance their ability to proceed to the Ph.D degree programme. The M.Phil/Ph.D Physiology programme is mainly by course work and research activities in Physiology. The research for the M.Phil/Ph.D degree will be independently carried out by the candidates under the supervision of members of staff of the Department. The M.Phil/Ph.D programme is designed to give more basic research opportunities and more exposure to master-level coursework and seminars to the prospective candidates. The programme is also intended to extend frontiers of knowledge in health and diseases which are areas of intense research and application activities worldwide. Through this programme, much-needed research and leadership personnel for academics, hospitals, medical facilities, institutions, government, and industries will be produced for national and international development.

3. PROGRAMME OBJECTIVES

The objective of the M.Phil/Ph.D in Physiology programme is to educate highly qualified researchers required for the expansion of fundamental knowledge and technological innovation through research and development as well as the needs of institutions of higher learning. The specific objectives of the programme are to:

i. provide candidates with adequate training on current research and methodological techniques particularly in the areas of Cardiovascular, Endocrinology and Metabolism, Reproductive, Gastrointestinal, and Neurophysiology;
ii. provide and promote sound research skills and culture in various areas of Physiology. This includes training students that carry out independent research and critical thinking; and

iii. develop candidates to the mastery of appropriate skills and articulate a critical analysis of current research findings in the various areas of Physiology.

4. PROGRAMME JUSTIFICATION

The growing need to improve our health care system can only be met through adequate training of researchers in the Basic Medical Sciences, including Physiology. The M.Phil/Ph.D Physiology Programme will be to train researchers in Basic Medical Sciences. It is a programme intended to foster the development of independent research skills and deeper knowledge to enhance student's ability to proceed to the Doctor of Philosophy (PhD). The graduates of the programme will be sufficiently trained/prepared for careers in academia, research institutes, and other health institutions. The graduate of the programme will also contribute to the economic development of Nigeria through improvement in medical research and health care delivery.

5. ADMISSION REQUIREMENTS

The requirements for admission into the MPhil/PhD programme consist of:

(c) Masters of Science (M.Sc.) in Physiology from the Federal University of Technology, Akure with a minimum CGPA of 3.00 on a 5-point grading system or a minimum overall score of 55% in a Masters degree,

(d) M.Sc or M.Tech. in Physiology from any other recognized University with a minimum CGPA of 3.00 on a 5-point grading system or a minimum overall score of 55% in a Masters degree or as applicable from the University where the candidate graduated from.

6. PROGRAMME DURATION

The M.Phil/Ph.D programme shall be a minimum of 12 months and a maximum of 18 months for conversion to PhD programme. The first two semesters shall be by course work and examinations after which the candidate should be ready for conversion examination. Any candidate who fails to meet the minimum requirement for conversion to PhD shall terminate the programme at the M.Phil level.

7. REQUIREMENTS FOR CONVERSION/GRADUATION

- **Conversion to PhD:**

  A candidate who is admitted for the M.Phil/Ph.D programme may be allowed to transfer to the Ph.D programme if he/she makes satisfactory progress in his/her study. Such candidate will be expected to fulfill the following requirements:

i. Register and pass a minimum of 12 units coursework;
ii. score a minimum of 60% or a 3.5 on a 5-point grading system;
iii. pass an oral examination on the research proposal (6 units) before a panel of examiners;
iv. fulfill all other conditions as prescribed by the Board of the School of Postgraduate Studies of the University.

- **Terminal MPhil Degree:**

  A candidate who is admitted for the M.Phil/Ph.D programmes but fails to meet the requirements for conversion to PhD programme as stated above, will be awarded a terminal degree of M.Phil if he/she meets the following requirements:

i. Register and pass a minimum of 12 units coursework;
ii. score a minimum of 50% or a 2.5 on a 5-point grading system;
iii. pass an oral examination on the research proposal (6 units) before a panel of examiners;
iv. fulfill all other conditions as prescribed by the Board of the School of Postgraduate Studies of the University.

8. COURSE OUTLINE

8.1 M.Phil /Ph.D IN CARDIOPULMONARY PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine signaling	3	0	0	3
TOTAL						**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 860	Cardiorespiratory Physiology	3	0	0	3
TOTAL						**6**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						**6**

8.2 M.Phil. /Ph.D. IN RENAL PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine signaling	3	0	0	3
TOTAL						**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 862	Renal Physiology and Body Fluids	3	0	0	3
TOTAL						**6**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						**6**

8.3 M.Phil/Ph.D IN METABOLISM AND ENDOCRINE PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 861	Gastrointestinal Physiology	3	0	0	3
TOTAL						**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 864	Nutrition and Metabolism	3	0	0	3
TOTAL						**6**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						**6**

8.4 M.Phil/Ph.D IN REPRODUCTIVE PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine signaling	3	0	0	3
TOTAL						**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 866	Reproductive Physiology	3	0	0	3
TOTAL						**6**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						**6**

8.5 M.Phil/Ph.D IN GASTROINTESTINAL PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 861	Gastrointestinal Physiology	3	0	0	3
TOTAL						**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 868	Gut Microbiota and Metabolites	3	0	0	3
TOTAL						**6**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						**6**

8.6 M.Phil/Ph.D IN NEUROPHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine signaling	3	0	0	3
TOTAL						**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 870	Neurochemistry and Behavioral Neuroscience	3	0	0	3
TOTAL						**6**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						**6**

8.7 M.Phil/Ph.D IN SPORTS AND EXERCISE PHYSIOLOGY

First Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 857	Project Report Writing and Grantsmanship	3	0	0	3
2.	PHS 859	Neuroendocrine signaling	3	0	0	3
TOTAL						**6**

Second Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 858	Seminars in Physiology	3	0	0	3
2.	PHS 872	Sports and Exercise Physiology	3	0	0	3
TOTAL						**6**

Third Semester

S/N	Course Code	Course Title	L	T	P	U
1.	PHS 889	M.Phil Thesis Research Project	0	0	18	6
TOTAL						**6**

9. M.Phil./Ph.D. COURSE CONTENT

PHS 857 Project Report Writing and Grantsmanship (3 Units)

This course introduces the students to the preparation of reports for various purposes. Emphasis should be on different reasons for report writing, that is to present information such as a laboratory report or financial report, to present research findings, or to analyze a problem and then recommend a particular action or strategy; types of report (long or short, formal or informal). The style and vocabulary choice should emphasize research and business report writing – the format, language style, and writing tips. Research funding opportunities and their requirements. Guide to writing a successful research grant proposal.

PHS 858 Seminars in Physiology (3 Units)

Selected topic in any emerging area of physiology but of interest to the student for literature review to be presented as a report after oral presentation.

PHS 859 Neuroendocrine Signaling (3 Units)

Coordination of Body Functions by Chemical Messengers, Chemical Structure and Synthesis of Hormones, Hormone Secretion, Transport, and Clearance from the Blood, Feedback Control of Hormone Secretion, Transport of Hormones in the Blood, "Clearance" of Hormones from the Blood, Mechanisms of Action of Hormones, Hormone Receptors and Their Activation, Intracellular Signalling After Hormone Receptor Activation, Second Messenger Mechanisms for Mediating Intracellular Hormonal Functions, Hormones that Act Mainly on the Genetic Machinery of the Cell, Measurement of Hormone Concentrations in the Blood, Radioimmunoassay, Enzyme-Linked Immunosorbent Assay (ELISA). Concept of second messenger and signaling systems; protein kinases; IP3, G-proteins etc. Hypothalamus-Pituitary axis and hormones. Hormonal actions of endocrine glands - Thyroid. Parathyroid, Adrenal cortex and Medulla including Renin Angiotensin Aldosterone System (RAAS). Pancreas. Pineal gland and diurnal rhythm. The Prostaglandins.

PHS 860 Cardiorespiratory Physiology (3 Units)

Components and Functions of the Cardiovascular System: The heart and; the blood vessels, Cardiac and vascular smooth muscle physiology, Pulmonary and systemic circulations, Blood flow, The Heart's Electrical Conduction System, Heartbeat Coordination, Sequence of Excitation, Cardiac Action Potentials and Excitation of the SA Node, The Standard 12-Lead Electrocardiogram, Excitation–Contraction Coupling, Refractory Period of the Heart, Mechanical Events of the Cardiac Cycle, Heart Sounds, Cardiac Output, Venous return, Stroke volume, Heart rate**,** Arterial Blood Pressure and Hypertension, Regulation of Arterial blood Pressure, Baroreceptor reflex, Other cardiovascular reflexes, Renin-angiotensin-aldosterone system, Regional circulations, Coronary circulation, Splanchnic circulation, Cerebral circulation, Fetal circulation, Circulatory shock, Circulatory adjustment during exercise. Mechanisms of Respiration. Work of breathing. Surfactant. Pulmonary circulation and hypoxic pulmonary vasoconstriction. Gas exchange in the lungs and Gas transport by blood. Fetal hemoglobin. Chemical and Neural Control of Respiration. Respiratory responses to exercise, altitude, deep sea diving, space travel, artificial respiration.

PHS 861 Gastrointestinal Physiology (3 Units)

General Principles of Gastrointestinal Function—Motility, Nervous Control, and Blood Circulation, Functional Types of Movements in the Gastrointestinal Tract, Gastrointestinal Blood Flow— "Splanchnic Circulation", Gastrointestinal motility. Secretory Functions of the GI Tract - Secretion of Saliva, Gastric Secretion, Pancreatic Secretion, Secretion of Bile by the Liver; Functions of the Biliary Tree, Secretions of the Small Intestine, Secretions of the Large Intestine, Digestion and Absorption in the Gastrointestinal Tract, Digestion and Absorption in the Gastrointestinal Tract, Physiology of Gastrointestinal Disorders, Gut microbiota and metabolism.

PHS 862 Renal Physiology and Body Fluids (3 Units)

Body Fluid Compartments, Constituents of Extracellular and Intracellular Fluids, Measurement of Fluid Volumes in the Different Body Fluid Compartments, Basic Principles of Osmosis and Osmotic Pressure, Edema: Excess Fluid in the Tissues, The Kidneys, Renal Clearance, Renal Blood Flow (RBF), and Glomerular Filtration Rate (GFR). Determinants of the GFR, Autoregulation of GFR and Renal Blood Flow, Urine Formation - Glomerular Filtration, Tubular Reabsorption, and Tubular Secretion, NaCl Regulation, K^+ Regulation, Renal Regulation of Urea, Phosphate, Calcium, and Magnesium, Concentration and Dilution of Urine, Renal Hormones, Acid–Base Balance, Diuretics. Micturition, Physiologic Anatomy and Nervous Connections of the Bladder, Transport of Urine from the Kidney Through

the Ureters and into the Bladder, the Cystometrogram, Micturition Reflex, Abnormalities of Micturition.

PHS 864 Nutrition and Metabolism (3 Units)

Aims of nutrition Energy content of food - Carbohydrates, protein, fats, Basal metabolic rate. Calorie requirements per day. Estimation of obesity e.g. Body Mass Index (BMI). Vitamins and mineral requirements and functions. Metabolism of Carbohydrates, and Formation of Adenosine Triphosphate - Release of Energy from Foods, and the Concept of "Free Energy", Role of Adenosine Triphosphate in Metabolism, Central Role of Glucose in Carbohydrate Metabolism, Transport of Glucose Through the Cell Membrane, Phosphorylation of Glucose, Muscle, Glycogenesis—The Process of Glycogen Formation, Removal of Stored Glycogen — Glycogenolysis, Release of Energy from the Glucose Molecule by the Glycolytic Pathway, Release of Energy from Glucose by the Pentose Phosphate Pathway, Formation of Carbohydrates from Proteins and Fats—"Gluconeogenesis", Blood Glucose, Lipid Metabolism, Transport of Lipids in the Body Fluids, Use of Triglycerides for Energy: Formation of Adenosine Triphosphate, Regulation of Energy Release from Triglycerides, Phospholipids and Cholesterol. Protein Metabolism, Transport and Storage of Amino Acids, Functional Roles of the Plasma Proteins, Hormonal Regulation of Protein Metabolism, Metabolic Functions of the Liver, Vitamins, Mineral Metabolism, Energetics and Metabolic Rate.

PHS 866 Reproductive Physiology (3 Units)

Gonads. Sex determination and differentiation. Male and Female reproductive systems. Assessment of infertility. Hypothalamic – pituitary influence. Menstrual cycle. Pregnancy and Lactation. Gonadal and placental hormones. Puberty and Menopause. Fetal Circulation. Fetal and Neonatal Physiology - Growth and Functional Development of the Fetus, Adjustments of the Infant to Extrauterine Life, Special Functional Problems in the Neonate, Special Problems of Prematurity.

PHS 868 Gut Microbiota and Metabolites (3 Units)

Gut microbiota composition and colonization of the gastrointestinal tract. Environmental influence on the gut microbiota. Gut microbiota metabolites. Gut microbiota signaling in the brain-gut-axis. Role of the gut microbiota in digestive function of the gastrointestinal tract. The role of gut microbiota in gut immunity, inflammation, and metabolic diseases (Obesity and diabetes).

PHS 870 Neurochemistry and Behavioral Neuroscience (3 Units)

Basic neurochemistry of the brain and nervous system complexity; Principles and concepts of the chemical and functional organization of the nervous system at the cellular and molecular levels; Structure and role of receptors in neurotransmission; Neurotransmitter systems and their functions in the brain - Acetylcholine, Catecholamine, Serotonin, histamine and melatonin, Amino acid neurotransmitters, Neuropeptide, Atypical neurotransmitters; Synaptic, presynaptic proteins and cell adhesion molecule; Neurotransmitter synthesis; Neurons and neuronal communication; Neurochemical processes underlying brain states and diseases; Neurochemical substances and mechanisms underlying behavioral patterns and disorders; Critical reading of primary literature and presentation; Mental Illnesses - psychiatric disorders: anxiety disorders, affective disorders, and schizophrenia; Cognitive Neuroscience of Memory and Perception**;** Animal models for evaluating various behavioral patterns, justifications, parameters, and endpoints.

PHS 872 Sport and Exercise Physiology (3 Units)

Review of Behaviour of physiological process in response to physical effort. Structural basis of muscle contraction, neural control of muscle, and energetics of muscle contraction. Energy/fuel utilization, fatigue, physiological adjustment during exercise, and influence of training. Review of muscle attachments and muscle action. Nerve supply and neurological control of movements. Location of the centers of gravity of the body. Biomechanisms of human motion. Fundamental standing positions/postures. Resolution of forces. Roles of muscle action. Types of body movements and uses. Introduction to electromyography studies. Analysis of normal and abnormal human locomotion; analysis of motor skill. All students of this course must visit and make a trip up Idanre hills in Idanre, Ondo State; and measure comparative physiological parameters at the base versus the top of the hills.

PHS 889 MPhil Project Dissertation (6 Units)

Research project on the candidate's area of interest presented in a report (Dissertation) examined orally before the panel of examiners.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF PHYSIOLOGY

S/N	Names	Qualifications	Rank/Status	Areas of Specialization
1.	Dr. T. G. Adedeji	B.Sc. (Ilorin), M.Sc, Ph.D (Ibadan)	Ass. Professor	Diet/Renal Physiology and epigenetics
2.	Dr. S. O. Jeje	B.Sc. (Ilorin), M.Sc. (Ibadan), Ph.D (Ibadan)	Ass. Professor	Reproductive Physiology
3.	Prof. A. S. Adeagbo	B.Sc, Ph.D (Ibadan)	Professor /Contract	Cardiovascular Physiology
4.	Dr. D. S. Arokoyo	MBBS (Zaria), M.Sc (Ibadan), Ph.D (Cape Town)	Senior Lecturer	Renal Physiology
5.	Prof. V. O. Ukwenya	B.Sc. (Ilorin), M.Sc. (Lagos), Ph.D (Ilorin)	Professor	Reproductive Anatomy
6.	Dr. T. P. Omayone	B.Sc. (Port-Harcourt), M.Sc, Ph.D (Ibadan)	Senior Lecturer	Gastrointestinal Physiology/Nutrition
7.	Dr. O. M. Okeowo	B.Sc. (Ago-Iwoye), M.Sc, Ph.D (Ibadan)	Lecturer I	Neuropharmacology
8.	Dr. (Mrs) G.T. Adefisayo	B.Sc (Ibadan), MBBS M.Sc, Ph.D (Ife)	Lecturer I	Cardiovascular Physiology
9.	Dr. T. S. Olawuyi	B.Sc, M.Sc. (Ilorin), Ph.D (Port Harcourt)	Senior Lecturer / Associate	Reproductive Anatomy
10.	Dr. S. I. Oyeleye	B.Tech, M.Tech, Ph.D (Akure)	Lecturer I / Associate	Nutrigenomics
11.	Dr. O. B. Ogunsuyi	B.Tech, M.Tech, Ph.D (Akure)	Lecturer I / Associate	Neurobiochemistry

9.3 SCHOOL OF COMPUTING

9.3.1 DEPARTMENT OF COMPUTER SCIENCES (CSC)

1. PROGRAMMES OFFERED

(a) Postgraduate Diploma (PGD)
(b) Master of Tech. (M.Tech.)
(c) Master of Philosophy (M.Phil.)
(d) Doctor of Philosophy (Ph.D.)

2. AVAILABLE OPTIONS/SPECIALISATION

(a) PGD (Computer Science)
(b) M.Tech. (Computer Science)
(c) M.Phil. (Computer Science)
(d) Ph.D. (Computer Science)

3. PROGRAMMES PHILOSOPHY

a. Postgraduate Diploma in Computer Science

Exigencies and realities in technological development have placed increasing demands on the currency of information technology training vis-a-vis the necessity for continuous professional development. The postgraduate diploma in computer science programme will provide an opportunity for academic and professional advancement and education in computing and information technology discipline for: (i) holders of HND in Computer Science or related disciplines;

(ii) candidates intending to pursue higher degrees but whose enabling pre-requisite academic qualifications are deficient; and

(iii) candidates who are desirous to broaden their technical knowledge in order to effectively cope with increasing professional responsibilities in the places of work without necessarily leaving their jobs for full-time training programmes. Postgraduate diploma in computer science programme is also especially designed for professionals who would like to convert their career into Computer Science field. This programme is unique since it is suitable for all disciplines. It provides sufficient conceptual/theoretical knowledge, and essential practical skills in key areas of Computer Science.

b. M.Tech. (Computer Science)

The M.Tech. Computer Science degree is mainly by course work and research activities in Computer Science. In the first year of the M.Tech. programme, which consists of two semesters, students are expected to successfully complete the compulsory and/or elective courses in the programme to be eligible to start their theses in the first semester of the second year. Each course is assessed based on a written continuous assessment and a final examination at the end of the semester. Research for the M.Tech. degree programme will be independently carried out by the candidates under the supervision of members of staff of the Department. The programme is designed to extend frontiers of knowledge and making meaningful contributions to knowledge, particularly in computer science and information technology, which are areas of intense research and application activities worldwide. Through the M.Tech. programme much needed research and leadership personnel for academics, institutions, government and industry will be produced for national and international deployment.

c. M.Phil. (Computer Science)

The M.Phil. Programme is designed to meet the research needs of the candidates with the M.Sc. degree in Computer Science. It is intended to foster the development of independent research skills to enhance their ability to proceed to the Ph.D. degree programme. The M.Phil. Computer Science degree is mainly by course work and research activities in Computer Science. Research for this degree will be independently carried out by the candidates under the supervision of members of staff of the Department. The M.Phil. Programme is designed to give more basic research opportunities and more exposure to master-level course work and seminars to the prospective candidates. The programme is also designed to extend frontiers of knowledge and making meaningful contributions to knowledge, particularly in computer science and information technology, which are areas of intense research and application activities worldwide. Through this programme much needed research and leadership personnel for academics, institutions, government and industry will be produced for national and international deployment.

d. Ph.D. (Computer Science)

The Ph.D. in Computer Science is a research degree which culminates in a unique thesis that demonstrates original and creative research. As a research-oriented degree, the Ph.D. in Computer Science prepares exceptional students for careers at the cutting edge of academia, industry and government. Students are expected to demonstrate excellence in both defining and executing a substantial research project that forms a novel contribution to the state of the art in computing. With a highly individualised programme of study, the degree provides students with depth in their chosen research area coupled with a rigorous breadth of knowledge across the discipline. The Ph.D. students also become visible members of the research community by publishing research and through oral presentations at conferences and research seminars. Upon completing the Ph.D. programme, students are able to set their own research direction, teach and advise students, and work at the forefront of cutting-edge research in academia or at an industrial laboratory.

4. PROGRAMMES OBJECTIVES

a. Postgraduate Diploma (Computer Science)

The main thrust of the postgraduate diploma programme is to develop and broaden the academic and professional base and standing of graduates with a view to pursuing fulfilling and result-oriented careers in the field of computer Science.

The specific objectives of the programme are to:

(i) give opportunity for Computer Science graduates that intend to make up for deficiencies in their academic background to qualify to pursue higher degrees or the practice of computing and information technology professional;

(ii) develop Computer Science graduates academically so that they can be professionally qualified and result-oriented;

(iii) provide opportunity where candidates can acquire more expertise and techniques in the practice of computing profession;

(iv) create opportunity for research and development in Computer Science and

(v) provide opportunity for professionals who would like to convert their career into Computer Science field.

B. M.TECH./M.PHIL. (COMPUTER SCIENCE)

The specific objectives of the programmes are to:

(i) expose candidates to current researches and methodological models particularly in the Computer Science and information technology, which are areas of intense research and application activities world wide;

(ii) provide and promote sound practical and theoretical training in computer hardware, software and application areas, that will make the students useful in both private and public sectors of the economy; enable candidates to identify computing and information technology related problems and proffer recommendations and strategies for their solutions, and

(iii) develop in candidates the mastery of appropriate skills to articulate a critical analysis of advanced studies in computer science and information technology.

c. Ph.D. (Computer Science)

The objective of the Ph.D. in Computer Science programme is to educate highly qualified researchers required for the expansion of fundamental knowledge and technological innovation through research and development, as well as the needs of institutions of higher learning.

5. ADMISSION REQUIREMENTS

a. Postgraduate Diploma in Computer Science

The criteria for admission into the postgraduate diploma in Computer Science shall be as follows:

(i) Candidates with bachelor degrees from the Federal University of Technology, Akure must obtain a minimum of a Third Class degree in Computer Science or relevant disciplines;

(ii) Candidates with bachelor degrees from other recognised Universities must obtain a minimum of a Third Class degree in Computer Science or relevant disciplines;

(iii) Holders of HND in Computer Science or other relevant disciplines from recognised Polytechnics with a minimum of lower/upper credit may also be considered for admission; and

(iv) Other conditions as specified by the Board of the School of Postgraduate Studies of the University.

B. MASTER OF TECH. (COMPUTER SCIENCE)

The requirements for admission into the M.Tech. degree programme consist of:

(i) B.Tech. in Computer Science from the Federal University of Technology, Akure, Nigeria with at least a Second Class Honours (Lower Division), or

(ii) B.Tech. or B.Sc. in Computer Science from other reputable institutions with at least a Second Class Honours (Lower Division), or

(iii) Postgraduate Diploma in Computer Science from the Federal University of Technology, Akure, Nigeria or other reputable institutions with a CGPA of not less than 3.5 on a 5–point credit scale or a minimum score of 60%.

C. MASTER OF PHILOSOPHY (COMPUTER SCIENCE)

(a) The requirements for admission into the M.Phil. degree programme consist of:

(i) M.Tech. in Computer Science from Federal University of Technology, Akure, Nigeria with a CGPA of not less than 3.0 on a 5-point credit scale or a minimum overall score of 55%, or

(ii) M.Tech. or M.Sc. in Computer Science from other institutions with a CGPA of not less than 3.0 on a 5- point credit scale or a minimum overall score of 60 %.

(iii) all applications for the programme shall be subjected to other School of Postgraduate Studies regulations and departmental carrying capacity.

(b) Requirements for Transfer to Ph.D. Degree Programme

A student who enters the M.Phil. degree programme may be allowed to transfer to the Ph.D. programme if he/she makes a satisfactory progress in his/her study. Such a student will be expected to fulfil the following requirements:

(i) candidate has completed all course work with a CGPA of not less than 3.5;

(ii) candidate successfully presented at least two seminars; proposal and progress seminars,

(iii) candidate prepares and submits to the School of Postgraduate Studies through the Department, a research plan considered suitable for pursuing a Ph.D. degree;

(iv) candidate presents a detailed report of research work done up to the time and submit to the School of Postgraduate Studies any relevant published and unpublished materials (if any) that can be assessed by the Department;

(v) candidate passes an oral transfer examination to be conducted by the School of Postgraduate Studies with the panel of examiners drawn from his/her Department on the subject of the research and related topics to the field of study; and

(vi) fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University.

D. DOCTOR OF PHILOSOPHY (COMPUTER SCIENCE)

The requirements for admission into the Ph.D. programme consist of:

(i) M.Tech. in Computer Science from the Federal University of Technology, Akure, Nigeria with a CGPA of not less than 3.5 on a 5–point credit scale, or

(ii) M.Tech. or M.Sc. in Computer Science from other reputable institutions with a CGPA of not less than 3.5 on a 5–point credit scale or a minimum overall score of 60%, or

(iii) M.Phil. in Computer Science from the Federal University of Technology, Akure, Nigeria or other a recognised/reputable universities with a CGPA of not less than 3.5 on a 5–point scale credit scale or a minimum overall score of 60%.

SELECTION PROCESS

There will be a qualifying written examination for all candidates seeking admission into the postgraduate programmes in Computer Science of the University. Admission may be offered to all candidates satisfying the eligibility requirements subject to viable groups and availability of teaching facilities. Admission will be finally determined strictly by their performance in the examination.

6. DURATION OF PROGRAMME

(a) Postgraduate Diploma in Computer Science

The Postgraduate Diploma in Computer Science programme can be completed in two academic sessions (four semesters).

(b) Master of Tech. (Computer Science)

The duration of the M.Tech. programme shall be a minimum of 18 months and maximum of 24 months on a full–time basis.

(c) Master of Philosophy (Computer Science)

The duration of the M.Phil. programme shall be a minimum of 18 months and maximum of 24 months on a full–time basis.

(d) Doctor of Philosophy (Computer Science)

The duration of the Ph.D. programme shall be as follows:

(i) Full–Time: A minimum of 36 months and maximum of 42 months

(ii) Part–Time: A minimum of 48 months and maximum of 60 months

7. REQUIREMENTS FOR GRADUATION

a. POSTGRADUATE DIPLOMA IN COMPUTER SCIENCE

To be eligible for the award of the postgraduate diploma degree in Computer Science, a candidate must have:

(i) passed all the courses recommended by the Department;

(ii) fulfilled all other conditions as prescribed by the Board of the School of Postgraduate Studies of the University, and

(iii) successfully completed and defended a research project in an oral examination by a Panel of Examiners.

B. M.TECH. COMPUTER SCIENCE

To be eligible for the award of the M.Tech. degree in Computer Science, a candidate must have:

(i) passed all the courses recommended by the Department;

(ii) successfully presented at least two seminars: proposal and progress seminars;

(iii) fulfilled all other conditions as prescribed by the Board of the School of Postgraduate Studies of the University, and

(iv) successfully completed and defended a research thesis in an oral examination by a Panel of Examiners.

C. M.PHIL. COMPUTER SCIENCE

To be eligible for the award of the M.Phil. degree in Computer Science, a candidate must have:

(i) passed all the courses recommended by the department;

(ii) successfully presented at least two seminars: proposal and progress seminars;

(iii) fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University, and

(iv) successfully completed and defended a research thesis in an oral examination.

D. Ph.D. COMPUTER SCIENCE

To be eligible for the award of the Ph.D. degree in Computer Science, a candidate must have:

(i) successfully presented at least three seminars;

(ii) fulfilled all other conditions as prescribed by the Board of the School of Postgraduate Studies of the University, and

(iii) successfully completed and defended a research thesis in an oral examination by a Panel of Examiners.

COURSE OUTLINE

PGD (COMPUTER SCIENCE)

First Year First Semester

Course Code	Course Title	L	T	P	U
CSC701	Computing Systems	3	0	3	3
CSC703	Digital Design	3	0	0	3
CSC705	Data Structures and Algorithms	2	0	0	3
CSC707	Systems Analysis and Design	2	0	0	3
CSC709	Optimisation Techniques	2	0	0	3
Total	**15**				

First Year Second Semester

Course Code	Course Title				
		L	T	P	U
CSC702	Software Engineering	3	0	0	3
CSC704	Computer Systems Architecture	2	0	0	3
CSC706	Advanced Microcomputing	3	0	3	3
CSC708	Computer Graphics	3	0	0	3
CSC710	Computational Algorithms and Complexities	3	0	0	3
Total					**15**

PGD Second Year First Semester

Course Code	Course Title				
		L	T	P	U
CSC721	Object-Oriented Programming	3	0	0	3
CSC723	Operating Systems	3	0	0	3
CSC725	Communications and Networks	3	0	0	3
CSC727	Computer Systems Performance Evaluation	3	0	0	3
CSC729	Technology Management and Professional Issues	3	0	0	3
Total					**15**

PGD Second Year Second Semester

Course Code	Course Title				
		L	T	P	U
CSC722	Compiler Construction	3	0	0	3
CSC724	Web Programming	3	0	0	3
CSC726	Cluster Computing	3	0	0	3
CSC728	Database Systems	3	0	0	3
CSC799	PGD Research Project	0	0	9	6
					18

M.TECH. (COMPUTER SCIENCE)

First Semester

Course Code	Course Title	L	T	P	U
CSC801	Special Topics in Computer Science	3	0	0	3
CSC803	Advanced Database Systems	3	0	0	3
CSC805	Computer Systems Architecture	3	0	0	3
CSC807	Research Methodology	2	0	0	2
CSC809	Advanced Data Structures & Algorithms	3	0	0	3
CSC811	Advanced Compiler Construction	3	0	0	3
CSC813	Electronic Commerce Technologies	3	0	0	3
CSC815	Advanced Java	3	0	0	3
CSC817	Introduction to Quantum Computing	3	0	0	3
	TOTAL				**26**

Second Semester

Course Code	Course Title	L	T	P	U
CSC802	Communications & Computer Networks	3	0	0	3
CSC804	Advanced Operating Systems	3	0	0	3
CSC806	Expert systems	3	0	0	3
CSC808	Fault–Tolerant Computing	3	0	0	3
CSC810	Digital Signal Processing	3	0	0	2
CSC812	Advanced Software Engineering	3	0	0	3
CSC814	Concurrent and Distributed Systems	3	0	0	3
CSC 816	Mobile and Adaptive Systems	3	0	0	3
CSC818	Bioinformatics	3	0	0	3
CSC820	Grid Computing	3	0	0	3
	Total				**29**

Not less than fifteen (15) course units shall be mounted in each semester

M.Tech. SECOND YEAR

Course Code	Course Title	L	T	P	U
CSC899	Master's Thesis Research Project	0	0	36	12

M. PHIL (COMPUTER SCIENCE)

Candidates are expected to take at least three courses each semester from the available list of courses. However, Special Topics in Computing Science and Research Methodology are compulsory courses for all candidates.

M.Phil. First Semester

Course Code	Course Title	L	T	P	U
CSC881	Special Topics in Computing	3	0	0	3
CSC 883	Research Methodology	3	0	0	3
	Elective	3	0	0	3
	Total				9
	Electives				
CSC885	Advanced Database Systems	3	0	3	3
CSC887	High Performance Architectures	3	0	3	3
CSC889	Communications and Networks	3	0	3	3
CSC891	Machine Learning	3	0	3	3
CSC897	M.Phil. Research Project	0	0	36	12

M.Phil. Second Semester

Course Code	Course Title	L	T	P	U
CSC882	Computer and Network security	3	0	3	3
CSC884	Mobile and Adaptive Systems	3	0	3	3
	Elective	3	0	0	3
	Electives				
CSC 886	e-Systems	3	0	0	3
CSC 888	Concurrent and Distributed Systems	3	0	0	3
CSC 890	Grid Computing	3	0	0 3	
CSC 892	Biometrics Computing	3	0	0	3

M.Phil. Third And Fourth Semesters

Course Code	Course Title	L	T	P	U
CSC897C	M.Phil. Research Project	0	0	36	12

(D) Ph.D. (COMPUTER SCIENCE)

Course Code	Course Title	L	T	P	U
CSC999C	Ph.D. Research Project	0	0	36	12

COURSE SYNOPSES

a) Postgraduate Diploma in Computer Science

CSC701 – Computing Systems (3 units)

Historical background of computers; hardware and software systems; principles of programming; computer programming using any of the following programming languages: C, Pascal, Perl, Fortran or Visual Basic. It further addresses the analysis, design, programming, implementation, documentation and performance evaluation of application software in the domain of science and engineering.

CSC702 – Software engineering (3 units)

Pre–requisite – CSC701, CSC707

The techniques and methodologies of software engineering; specification modelling; requirements analysis and definition; specification; software design; quality assurance; testing; reuse; development tools and environments; object-oriented development, unified modified language.

CSC703 – Digital design(3 units)

Number systems, computer arithmetic, Boolean algebra, combinational and sequential circuits, circuit minimisation techniques, and principles of digital computing.

CSC704 – Computer systems architecture (3 units)
Pre–requisite – CSC703

Introduction to computer systems, instruction set principles, instruction-level parallelism and its dynamic exploitation, exploiting instruction-level parallelism with software, memory hierarchy design, multiprocessor and thread-level parallelism, storage systems, interconnection networks and clusters, basic and intermediate concepts of pipelining, a survey of RISC architectures for desktop, server and embedded systems.

CSC705 – Data structures and algorithms(3 units)

Elementary data structures, stacks, queues, lists, tables, trees, binary trees, search trees, heaps and priority queues, sorting, hashing and hashing techniques

CSC706 – Advanced microcomputing (3 units)

Pre–requisite – CSC701

Advanced study and use of Microsoft office productivity suite with an emphasis on database design and development; VBA programming language and VB .NET are tools studied for the development of customised solutions for business and personal needs.

CSC707 – Systems analysis and design (3 units)

Systems concepts; software development life cycle; structured top-down and bottom-up design, dataflow diagramming, entity relationship modelling; study of computer aided software engineering, I/O design and validation, file and database design; design of user interfaces; comparison of structured and object-oriented design.

CSC708 – Computer graphics (3 units)

Introduction to hardware and software techniques for the display of graphical information. 2D and 3D geometry and transformations, clipping and windowing, software systems. Interactive graphics, shading, hidden surface elimination, perspective depth. Modelling and realism.

CSC709 – Optimisation techniques (3 units)

Linear programming; transportation problems and network analysis, games and strategies; queuing theory, project scheduling, inventory programming.

CSC710 – Computational algorithms and complexities (3 units)

Basic aspects of the theory of algorithms, including divide-and-conquer, dynamic programming and greedy, several graph algorithms, randomised algorithms, and approximation algorithms, together with an introduction to undecidability, and to NP-completeness.

CSC721 – Object-oriented programming (3 units)

Basic concept of object-oriented programming (OOP); study of the features of a common OOP language such as Java, C++, and the like; exception handling; introduction to object-oriented design; implementing common data structures; application of OOP in the development of systems and application software; class libraries and frameworks.

CSC722 – Compiler construction (3 units)

Introduction to theory of computation; anatomy of a compiler; lexical analysis; syntax analysis; syntax-directed translation; semantic analysis, intermediate code generation; code generation and optimisation.

CSC723 – Operating systems (3 units)

Pre–requisite – CSC704

Operating system concepts and structure; processes (communication and scheduling); memory management; input/output and file systems; deadlocks; protection and security; an overview of major operating systems and a case study of Windows and Unix operating systems. Introduction to distributed operating systems.

CSC724 – Web programming (3 units)

Pre–requisite – CSC701, CSC721

Technology underlying the internet; core network protocols; programming web documents including HTML, JavaScript, PHP scripting language and MySQL relational database; dynamic web site creation using both client- and server-side techniques.

CSC725 – Communications and networks (3 units)

Introduction to digital and analogue representations and channels; bandwidth and noise; channel capacity; Nyquist, Shannon; telecommunication history; circuit switching and packet switching; multiplexing; FDM, TDM, statistical multiplexing; virtual circuits and datagrams; Aloha, CSMA, CSMA-CD, token passing, CDMA, wireless LANs and performance analysis; errors, coding and redundancy; hamming theory and codes; CRCs, selective retransmission; overview of computer networks; the OSI and TCP/IP models; transmission medium; overview of network services and protocols, applications and security; and internetworking and the internet.

CSC726 – Cluster Computing (3 units)

Pre–requisite – CSC725

Generic architecture of a cluster computer; system architecture: SMP, network interface and topology, network communication protocols including TCP/IP programming and low-latency protocols such as virtual interface architecture; cluster runtime support; parallel programming: shared memory programming, distributed memory programming using MPI and sockets, middleware programming such as CORBA, remote procedure call; and parallel programming and applications.

CSC727 – Computer systems performance evaluation (3 units)

Overview of techniques for measuring, improving, and tuning the performance of computer systems. Procurement, workload characterisation, measurement principles, the representation of measurement data, software and hardware monitors, capacity planning, bottleneck detection, system and program tuning, simulation and analytic models and their applications, case studies.

CSC728 – Database systems (3 units)

Database concepts: file systems and databases, and the relational database model; design concepts and implementation: entity relationship modelling; normalisation of database tables and structured query language; database design and implementation; transaction management; concurrency control; distributed database management systems; object-oriented databases; database privacy, security, failure and recovery.

CSC729 – Technology management and professional Issues (3 units)

Technological systems and organisations; characteristics of systems and organisations; professional issues; legal issues; ethical issues; risk; risk assessment and management; project management; skills of a project manager and resource planning.

CSC799 – PGD research project (6 units)

An independent or group investigation of appropriate software, hardware or communication and networks problems in computer are carried out under the supervision of a lecturer. Before registering, the student must submit a written proposal to the supervisor to review. The proposal should give a brief outline of the project, estimated schedule of completion, and computer resources needed. A formal

written report is essential and an oral presentation may also be required.

(a) M.TECH. COMPUTER SCIENCE

CSC801 – Special Topics in Computing (3 Units)

A study of the current trends and popular recent research in computer science will be the focus of this course. Apart from seminars to be given by lecturers, students are expected to do substantial readings on their own.

CSC802 – Communications and Networks (3 Units)

Channels and channel capacity, introduction to information theory, sharing network resources – telecommunications history, circuit switching and packet switching, multiplexing, FDM, TDM, statistical multiplexing, virtual circuits and datagrams, advantages and disadvantages, Sharing the medium – Aloha, CSMA (persistent and non-persistent), CSMA-CD, token passing, CDMA, Wireless LANs and simple performance analysis, Dealing with errors: errors, coding and redundancy, hamming theory and codes, CRCs, ARQ protocols, selective retransmission and flow control, Internetworking and the internet: ISPs, datagram forwarding, the DNS, IPv4, addressing and forwarding, encapsulation and address resolution, TCP and UDP, Ports and Congestion controls, Example applications, Modelling data networks: services and protocols, layered architectures, the OSI 7-layer model, Introduction to queue theory, physical media, LANs and bridging, WANs and Point-to-Point links, routing, addressing and routing in the internet, end-to-end communication in the internet and application protocols.

CSC803 – Advanced Database Systems (3 Units)

A brief introduction to database concepts: file systems and databases, and the relational database model, Design concepts and implementation, entity relationship modelling, Normalisation of database tables and structured query language, Database design and implementation. Transaction management and concurrency control, Distributed database management systems, Database privacy, security, failure and recovery. Object-oriented databases, client/server systems, the data warehouse, databases in electronic commerce, web database development and database administration.

CSC804 – Advanced Operating Systems (3 units)

History of operating systems, operating system concepts and structure. Processes (communication and scheduling), memory management, input/output and file systems and an introduction to distributed systems. Protection and security. Case studies and comparative analysis of the MS–DOS, Linux system, Windows, FreeBSD system, and Mach system.

CSC805 – Computer Systems Architecture (3 Units)

Fundamentals of computer systems, instruction set principles, instruction-level parallelism and its dynamic exploitation, exploiting instruction-level parallelism with software, memory hierarchy design, multiprocessor and thread-level parallelism, storage systems, interconnection networks and clusters, basic and intermediate concepts of pipelining, a survey of RISC architectures for desktop, server and embedded systems.

CSC806 – Expert systems (3 Units)

The basic concept of expert system; knowledge representation schemes; knowledge acquisition; design, implementation and evaluation of knowledge-based expert system. An introduction to soft computing concept. Implementation and evaluation of neuro-fuzzy expert system.

CSC807 – Research Methodology (2 Units)

Introduction to research methods (experimental design and analysis, modelling and simulation and the likes), including research paradigms and methodologies across computer science, research question formulation, design of research approach, literature search and presentation of related work, analysis of results, verbal and written presentation skills, and research ethics. Students prepare and defend a mini-project proposal in an area of their choice.

CSC808 – Fault–tolerant computing (3 units)

Introduction and overview of fault-tolerant schemes; fault and error modelling; test generation and fault simulation; concepts in fault-tolerance; reliability/availability modelling; system level diagnosis; low level fault-tolerance: error correcting coding, byte-error detecting; high-level fault-tolerant techniques in systems: rollback, checkpointing, reconfiguration; software fault-tolerance; fault-tolerant routing; integrated hardware/ software fault-tolerance.

CSC809 – Advanced data structures and algorithms (3 Units)

Review of data structures; review of mathematical preliminaries: order notation, summations, recurrences; graph exploration: connected components, bi-connected components, topological sorting, strongly-connected components; greedy algorithms: minimal spanning trees, shortest paths, scheduling; divide-and-conquer: merge sort, quick sort, median and selection sorts; lower bound for finding minimum and sorting. Parallelism, a taste of parallel algorithms, parallel algorithm complexity, models of parallel processing. NP–completeness.

CSC810 – Digital signal processing (3 Units)

Introduction; brief review of analogue and digital signal processing systems; discrete time linear time-invariant signal processing systems; design of finite impulse response digital filters; introduction to z-transforms and infinite impulse response type discrete time filters; design of infinite impulse response type digital filters using analogue filter approximations; digital processing of analogue signals and other data; introduction to the discrete Fourier transform.

CSC811 – Advanced compiler construction (3 units)

Anatomy of a compiler; lexical analysis; syntax analysis; syntax-directed translation; semantic analysis, intermediate

code generation; code generation and optimisation. Garbage collection; dynamic data structures, pointer analysis, aliasing; code scheduling, pipelining; dependence testing; loop level optimisation; superscalar optimisation; profile-driven optimisation; debugging support; incremental parsing; type inference; advanced parsing algorithms; practical attribute evaluation; function in-lining and partial evaluation.

CSC812 – Advanced Software Engineering(3 units)

Introduction to the techniques and methodologies of software engineering, specification modelling, requirements analysis and definition, specification, agile software development, software design, quality assurance, testing, development tools and environments and software engineering ethics. Dependability and security. Software reuse, component-based software engineering, distributed software engineering, service–oriented architecture, embedded software and aspect–oriented software engineering. Software management–project management, project planning, quality management, configuration management and process improvement. Modern software review techniques and technologies.

CSC813 – Electronic commerce technologies (3 Units)

Introduction; the sociology and psychology of electronic commerce: building, recognising, managing and making use of online communities in web-based environments, theories of online presence and cooperation; a guide to e-commerce in general: how to differentiate e-commerce today from e-commerce yesterday, current problems of e-commerce and interesting solutions and approaches to those problems; a guide to knowledge commerce: understanding knowledge as a commodity and as a process, and representing it in web-based environments; web architecture: structural design of e-commerce systems, client-server architecture, 2-, 3-, n-tier design, server farms, scalability, integration of legacy systems, Java beans, Enterprise Java beans and java server pages, particular problems posed by 24/7 operation and an open user community; data interchange: exchanging data over the internet, XML, style sheets, document type definition, metadata and document discovery, interchange of processes using WSDL and SOAP as examples; usability: user-interfaces design for websites, use of human computer interaction methodologies in evaluating user interfaces; electronic payments: technologies that support the processing of electronic payments, characteristics and properties of electronic payment systems; mass personalisation and the virtual customer: automation of the customer relationship, use of data to customise the web experience, cookies and their risks, rule-based filtering, implicit profiling, collaborative filtering.

CSC814 – Concurrent and distributed systems (3 units)

Process and thread management: basic process model, scheduling, critical sections and synchronisation; mutual exclusion; concurrency: modelling concurrent activity starting with Java threads; forms of communications, architectures, means of communications – shared memory, direct communication between process; security threats, case study – Unix (fork processes, communication using signals, pipes, sockets, shared memory; distributed systems: client-server model, naming and binding, remote procedure call general principles, protection and security; Java remote method invocation.

CSC815 – Advanced Java (3 Units)

Performance and programming style: what is performance?, improving performance, programming tips and tools; persistence in Java: serialisation and Java database connectivity; common object request broker architecture, reflection and JavaBeans; Java foundation classes; remote method invocation; Java native interface; security; overview of optional packages

CSC816 – Mobile and Adaptive Systems (3 Units)

Introduction and overview, properties of wireless; PANs, LANs and WANs: Ad-hoc and infrastructure networks, physical constraints and limitations (transmission and reception), Network structures and architectures, including hand-off and mobility support at the physical/link level, Example technologies at the physical/link layers: PANS – bluetooth, LANs – IEEE802.11, HiperLAN, Basic GSM and GPRS network structures, protocol architectures, next generation wireless overview including UMTS, IMT-2000 and W-CDMA, Mobile IP, problems with routing, quality of service and security, mobile systems and power management issues, file systems. Adaptive and re-configurable systems, Mobile multimedia and its relationship to proxying, Context sensitive applications, Ubiquitous computing, Pervasive computing and Ambient networking, overlay networks and vertical hand-offs, programmable networking and applications for mobile systems, code mobility and control/ signalling.

CSC817 – Introduction to quantum computing (3 Units)

The theory of quantum information and quantum computation; classical information theory, compression of quantum information, transmission of quantum information through noisy channels, quantum entanglement, quantum cryptography; classical complexity theory, quantum complexity, efficient quantum algorithms; quantum error-correcting codes, fault-tolerant quantum computation; and physical implementations of quantum computation.

CSC818 – Bioinformatics (3 Units)

Basic molecular biology: cell structure and function – cell components, different type of cell, chromosome structure and organisation, cell division; the hereditary material: DNA structure, replication and protein synthesis, structure and roles of RNA, genetic code, mechanism of protein synthesis, mutation; recombinant DNA technology; genomics and

structural genomics; bioinformatics application: biological databases; gene prediction; detecting distant homology; protein structure prediction; transcriptomics; agent-based genome analysis and drug discovery informatics.

CSC820 – Grid computing (3 Units)

The metacomputing problem: forerunner to the grid. Exploring the convergence of exploitation of high-speed networks, exploitation of architectural affinity, work on coupled multiphysics problems. Grid computing: a persistent metacomputing environment.

Digital certificates as a persistent and scalable form of authorisation, visualisation of resources, hiding of complexity of metacomputing environment from user. Role of middleware in grid computing. Necessity for abstractions in a heterogeneous environment, differing operating systems, resource management systems, programming languages. Interoperability achieved via tiered middleware architectures. Abstract modelling approach to middleware problems.

CSC899 – Master's research project (12 Units)

An independent investigation of an appropriate computing research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organised and well-written form. The candidate is required to present at least two/three seminar papers before the final oral presentation. The thesis is examined in a viva voce.

(C) M.PHIL. COMPUTER SCIENCE

CSC 881 – Special topics in computing (3 Units)

A study of the current trends and popular recent research in computer science will be the focus of this course. Apart from seminars to be given by lecturers, students are expected to do substantial readings on their own.

CSC 882 – Computer and network security (3 Units)

Introduction, threats, risks and vulnerabilities, data security policies/administration, security procedural control, security models, designing secure systems, effects of hardware on security, operating systems security, network security, database security, programming language security, cryptography, distributed systems security, and information systems security.

CSC883 – Research methodology (3 Units)

Introduction to research methods (experimental design and analysis, modelling and simulation and the likes), including research paradigms and methodologies across computer science, research question formulation, design of research approach, literature search and presentation of related work, analysis of results, verbal and written presentation skills, and research ethics. Students prepare and defend a thesis proposal or project proposal in an area of their choice.

CSC884 – Mobile and adaptive systems (3 Units)

Introduction and overview, properties of wireless; PANs, LANs and WANs: Ad-hoc and infrastructure networks, physical constraints and limitations (transmission and reception), Network structures and architectures, including hand-off and mobility support at the physical/link level, Example technologies at the physical/link layers: PANS – bluetooth, LANs – IEEE802.11, HiperLAN, Basic GSM and GPRS network structures, protocol architectures, next generation wireless overview including UMTS, IMT-2000 and W-CDMA, Mobile IP, problems with routing, quality of service and security, mobile systems and power management issues, file systems. Adaptive and re-configurable systems, Mobile multimedia and its relationship **to** proxying, Context sensitive applications, Ubiquitous computing, Pervasive computing and Ambient networking, overlay networks and vertical hand-offs, programmable networking and applications for mobile systems, code mobility and control/ signalling.

CSC885 – Advanced database systems (3 Units)

A brief introduction to database concepts and the relational database model, Design concepts and implementation, entity relationship modelling, Normalisation of database tables and structured query language, Database design and implementation. Transaction management and concurrency control, Distributed database management systems, Database privacy, security, failure and recovery. Object-oriented databases, client/server systems, the data warehouse, databases in electronic commerce, web database development and database administration.

CSC886 – eSystems (3 Units)

Introduction to esystems, the sociology and psychology of electronic commerce, Theories of online presence and cooperation, a guide to e-commerce and knowledge commerce in general, Web architecture, Data interchange, Usability, Electronic payments, Mass personalisation and the virtual customer.

CSC887 – High performance architectures (3 Units)

Fundamentals of computer systems, instruction set principles, instruction-level parallelism and its dynamic exploitation, exploiting instruction-level parallelism with software, memory hierarchy design, multiprocessor and thread-level parallelism, storage systems, interconnection networks and clusters, basic and intermediate concepts of pipelining, a survey of RISC architectures for desktop, server and embedded systems.

CSC888 – Concurrent and distributed systems (3 Units)

Process and thread management: basic process model,

scheduling, critical sections and synchronisation, mutual exclusion, Concurrency: modelling concurrent activity starting with Java threads, forms of communications, architectures, means of communications – shared memory, direct communication between process, security threats, case study – Unix (fork processes, communication using signals, pipes, sockets, shared memory; distributed systems: client-server model, naming and binding, remote procedure call general principles, protection and security; Java remote method invocation.

CSC889 – Communications and networks (3 Units)

Channels and channel capacity, introduction to information theory, sharing network resources – telecommunications history, circuit switching and packet switching, multiplexing, FDM, TDM, statistical multiplexing, virtual circuits and datagrams, advantages and disadvantages, Sharing the medium – Aloha, CSMA (persistent and non-persistent), CSMA-CD, token passing, CDMA, Wireless LANs and simple performance analysis, Dealing with errors: errors, coding and redundancy, hamming theory and codes, CRCs, ARQ protocols, selective retransmission and flow control, Internetworking and the internet: ISPs, datagram forwarding, the DNS, IPv4, addressing and forwarding, encapsulation and address resolution, TCP and UDP, Ports and Congestion controls, Example applications, Modelling data networks: services and protocols, layered architectures, the OSI 7-layer model, Introduction to queue theory, physical media, LANs and bridging, WANs and Point-to-Point links, routing, addressing and routing in the internet, end-to-end communication in the internet and application protocols.

CSC890 – Grid computing (3 Units)

The metacomputing problem: forerunner to the grid. Exploring the convergence of exploitation of high-speed networks, exploitation of architectural affinity, work on coupled multiphysics problems. Grid computing: a persistent metacomputing environment. Digital certificates as a persistent and scalable form of authorisation, visualisation of resources, hiding of complexity of metacomputing environment from user. Role of middleware in grid computing. Necessity for abstractions in a heterogeneous environment, differing operating systems, resource management systems, programming languages. Interoperability achieved via tiered middleware architectures. Abstract modelling approach to middleware problems.

CSC891 – Machine learning (3 Units)

Introduction, concept learning and general-to-specific ordering, decision tree learning, supervised learning, artificial neural networks, evaluating hypotheses, Bayesian learning, instance-based learning, statistical learning methods, memory based learning, transformation based learning, inductive logic programming, support vector machine, unsupervised learning, temporal difference learning, reinforcement learning, Explanation based learning.

CSC892 – Biometrics computing (3 Units)

Introduction to biometric process, biometric parameters, different biometric system architecture, fingerprint based biometrics, face recognition systems, iris based biometrics, speaker recognition systems using voice, retina scan based biometrics, hand scan based biometrics, comparison of different biometrics verification techniques, multimodal biometrics, biometric watermarking.

CSC897 – M.Phil. research project (12 Units)

An independent investigation of an appropriate computing research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organised and well-written form. The candidate is required to present at least two seminar papers before the final oral presentation. The thesis is examined in a viva voce.

Ph.D COMPUTER SCIENCE

CSC999 – Ph.D. research project

An independent investigation of an appropriate computing research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organised and well-written form. The candidate is required to present at least two seminar papers before the final oral presentation. The thesis is examined in a viva voce.

The following are the major areas of research for which the facility is available to the members of staff in the Department: soft computing; machine intelligence; database systems; software engineering; computer architecture; operating systems; networking and distributed systems; network and computer security; computer graphics; multimedia systems; data mining and warehousing among others. Candidates applying to the Ph.D. in Computer Science programme should consider these areas.

LIST OF ACADEMIC STAFF IN THE DEPARTMENT OF COMPUTER SCIENCE (CSC)

S/N	NAME	QUALIFICATIONS	RANK / STATUS	AREA OF SPECIALISATION
1.	Dr. Festus Adeyinka OSUOLALE	B.Tech, M.Tech, PhD Computer Science (Akure)	Senior Lecturer	Cloud, High-Performance and Fault Tolerant Computing, Computer Network and Internet Security
2.	Prof. Samuel Oluwole FALAKI	M.Sc, Electrical Engineering (Leningrad Polytechnic), M.Sc, Computer Science (California), PhD Electrical Engineering (Lagos)	Emeritus Professor	Computer Network Security, HPC, Computer Architecture
3.	Prof. Olumide Sunday ADEWALE	B.Sc. Computer Science/Maths (Ago-Iwoye), M.Tech, PhD Computer Science (Akure)	Professor	Computing and Communications, Intelligent Systems, Sustainable Computing, e-Applications Engineering
4.	Prof. Samuel Adebayo OLUWADARE	B.Sc. Agric Economics (Ibadan); M.Tech, PhD Computer Science (Akure)	Professor	Soft and High Performance Computing and Computational Intelligence.
5.	Prof. Olumide Olayinka OBE	B.Tech Computer Science (Akure), M.Sc. Computer Science (Lagos), PhD Computer Science (Bucharest)	Professor	AI, Soft Computing, Robotics, Data Science, Control and Mobile Systems, IOT4D, Assistive and Affective Computing
6.	Dr. Akintoba Emmanuel AKINWONMI	B.Sc. Biochemistry (Lagos), PGD Computer Science, M.Tech, PhD Computer Science, (Akure)	Senior Lecturer	Artificial Intelligence, Machine learning and Natural Language Processing
7.	Dr. Victor Akinbola OLUTAYO	B.Sc. Computer Science (Ado-Ekiti), M.Sc. Computer Science (Ibadan), PhD Computer Science (Benin City)	Senior Lecturer	Information Technology Service Management, Machine Learning and Data Science
8.	Dr. Ilobekemen Perpetual OLADOJA	B.Sc. Computer Science (Owo), M.Tech, PhD Computer Science (Akure)	Lecturer II	Cloud Computing and Soft and High-Performance Computing
9.	Dr. Emmanuel Bamidele AJULO	B.Tech., M.Tech Computer Science (Ogbomoso) M.Tech., PhD, Computer Science (Akure)	Lecturer II	Information Security, Signal Processing, and Intelligent Systems
10.	Dr. IyanuOluwa Pelumi ADEGUN	B.Tech, M.Tech, Computer Science (Akure) MSc Computer Science (Johannesburg)	Lecturer II	Artificial Intelligence

9.3.2 DEPARTMENT OF CYBER SECURITY

CURRICULUM FOR POSTGRADUATE DIPLOMA (PGD) PROGRAMME IN CYBER SECURITY

1. PROGRAMME OFFERED: Postgraduate Diploma (PGD) in Cyber Security

2. PROGRAMME PHILOSOPHY

The Postgraduate Diploma in Cybersecurity is designed to equip prospective students with the essential computing skills desirable for the effective performance of personnel in the universities, industries and government establishments. It will allow for the development of systems to combat various cyber-attacks and defense of critical infrastructure leveraged on Information Technology.

3. PROGRAMME OBJECTIVES

The objectives of the programme are to:

i) develop and give academic and professional training in all areas of Cyber Security for the development of latent power of thinking in individuals;

ii) provide and promote sound basic practical and theoretical training in Cyber Security as foundation for research and technological development in Nigeria;

iii) give practical experience of Cyber Security for National Security and the protection of National Critical Infrastructure, and;

iv) give opportunity for Cyber Security or related field graduates that intend to make up for deficiencies in their academic background to qualify to pursue higher degrees or practice as a professional Statistician

4. PROGRAMME JUSTIFICATION

The field of Cyber Security has continued to witness increasing expansion as new areas and new techniques are developed. In addition, demand for products of the programme has risen in recent times. In view of the above considerations, the Department of Cyber Security is proposing to review the PGD Cyber Security programme to bring it in tune with the University wide goal of enhancing the relevance of course and repositioning the University as a centre of excellence.

5. ADMISSION REQUIREMENTS

Applicants must have a first degree of The Federal University of Technology, Akure or any other recognized University in a Science, Engineering, Social Science, Management or Technology based discipline, with a minimum of third class.

Holder of the HND from recognized Polytechnics and other Institutions with at least **Lower** Credit may be considered.

6. PROGRAMME DURATION

The programme is expected to run on a full-time basis for a minimum of four (4) semesters and a maximum of five (5) semesters.

7. GRADUATION REQUIREMENTS

To be eligible for the award of the PGD in Cyber Security, a candidate must have:

i) passed all core courses and successfully completed the project work

ii) passed a minimum of 63 credit units, made up as follows:
   a) 57 credit units in core courses
   b) 6 compulsory credit units of research project

8. **COURSE OUTLINE**

FIRST YEAR FIRST SEMESTER

Course Code	Course Title	L	T	P	U
CYS 701		2	-	3	3
CYS 703		2	-	3	3
CYS 705		3	-	0	3
CYS 707		2	-	3	3
CYS 709		3	-	0	9
Total					15

FIRST YEAR SECOND SEMESTER

Course Code	Course Title	L	T	P	U
CSY 702	Security, Policy, Ethics, and the Legal Environment	3	-	0	3
CYS 704	System Admin & Network Services	2	-	3	3
CYS 706	Information Sec. Eng., Management and Evaluation	2	-	3	3
CYS 708	Ethical Hacking and Reverse	2	-	3	3

	Engineering				
CYS 710	Enterprise and Perimeter Security	**2**	**-**	**3**	**3**
Total					**15**

SECOND YEAR FIRST SEMESTER

Course Code	**Course Title**	**L**	**T**	**P**	**U**
CYS 721	Introduction to Machine Learning	**2**	**-**	**3**	**3**
CYS 723	Cybercrime	**2**	**-**	**3**	**3**
CYS 725	Business Continuity, Disaster Recovery, and Incident Management	**2**	**-**	**3**	**3**
CYS 727	Introduction to Cryptography	**2**	**-**	**3**	**3**
CYS 729	Biometrics Security	**2**	**-**	**3**	**3**
CYS 799	PGD Research Project	**-**	**-**	**18**	**6**
Total					**21**

SECOND YEAR SECOND SEMESTER

Course Code	**Course Title**	**L**	**P**	**T**	**U**
CYS 722	Digital Forensics and Investigation Methods	3	-	0	3
CYS 724	Cloud Computing Security	3	-	0	3
CYS 726	Systems Vulnerability Testing and Assessment	3	-	0	3
CYS 728	Cyber Threat Intelligence and Conflicts	3	-	0	3
Total					**12**

9. COURSE SYNOPSES

CYS 701 Introduction to Computer and Network Security (3 Units)
Basic definitions, Asset security, Confidentiality, Integrity, Authentication, Availability. Ethics, Policy basics, Threat and risk basics, Recovery from attacks, Applied Cryptography, Symmetric-key crypto, Cryptographic hash functions. Public/private key cryptography, Information Hiding: Watermarking and Steganography. Hash Functions & Message Authentication Codes & Applications, Applications: Protecting users, data, and services , Password & User protection, File/Software integrity, Message authentication, Digital Signature, X.509 Digital Certificate, End-Point Authentication, Establishing Session Key, Secure e-mail, Passwords and user authentication, Distributed: Brief introduction to Kerberos, Encrypted file systems, Fundamentals of Computer Networking, Networks and Internet, Local Area and Wireless Networks, Network security, Port scanning, Transport-Level Security; SSL/TLS, Wi-Fi security, Malware: Viruses and Rootkits, Malware: Viruses and Rootkits, Worms and Botnets, Phishing, Threats and Mitigation, Firewalls and Intrusion Detection Systems, Online Tracking, VPNs, iptables, Anonymous Communications, Network Attacks: BGP, DNS, DoS, Tor and related systems.

CYS 702 Security, Policy, Ethics, and the Legal Environment (3 Units)
Cyber Security. Cyber Security Policy. Domains of Cyber Security Policy. Laws and Regulations. Enterprise Policy. Technology Operations. Technology Configuration. Strategy versus Policy. Cyber Security Metrics. Security Management Goals. Counting Vulnerabilities. Security Frameworks. E-Commerce Systems. Industrial Control Systems. Personal Mobile devices. Security Policy Objectives. Policy as a Project. Cyber Security Management. Arriving at Goals. Cyber Security Documentation using the Catalog Format. Cyber Security Policy Taxonomy. Cyber Governance Issues. Net Neutrality. Internet Names and Numbers. Copyrights and Trademarks. Email and Messaging. Cyber User Issues. Malvertising. Impersonation. Appropriate Use. Cyber Crime. Geolocation. Privacy. Cyber Conflict Issues. Intellectual Property Theft. Cyber Espionage. Cyber Sabotage. Cyber Warfare. Cyber Management Issues. Fiduciary Responsibility. Risk Management. Professional Certification. Supply Chain Security Principles. Cyber Infrastructure Issues.

CYS 703 Communication Networks (3 Units)
Communication Networks basics, Circuit Switched Networks, Switching Concepts, Layered Architecture, Introduction to DLL Layer, MAC Protocols – Ethernet, Wireless LAN, PON, Network Layer – IP, Routing Algorithms and Associated Protocols, Transport Layer, Introduction to Queuing, Application of Queuing theory for Design of Circuit Networks, Performance analysis of CSMA CD, CSMA CA, Advanced Networking Concepts: Open Flow switching, SDN and NFV, Network slicing, cognitive Networks.

CYS 704 System Admin & Network Services (3 Units)
Introduction to System Administration, Systems, SA Components, Building a Site
from Scratch, Growing a Small Site, Going Global, Replacing Services, Moving a Data Center, Handling a

High Rate of Office Moves, Assessing a Site, Server Environment: Known for Reliable Products, Understand the Cost of Server Hardware, Consider Maintenance Contracts and Spare Parts, maintaining Data Integrity, Put Servers in the Data Center, Client Server OS Configuration, and Provide Remote Console Access. Services and Management and Controlling System Issues, Managing Network Service and Network Establishment in VM to establish connection, Concepts of network Infrastructure, IP Tables Firewall and Monitoring of Network Resources SNMP Server Configuration, Logs Handling and Logs Management, Installation of Remote Desktop Server . Controlling and configuring the server Remotely. XRDP and how to manage XRDP Server and Client, Web Server, Significance of Web Server. Concepts of HTTP and HTTPS. Background services of Web Server, Installation and Configuration of Web Server on Centos. FTP, Installation and Configuration of FTP.

CYS 705 Fundamentals of Cyber Security (3 Units)

Cyber security introductory and foundational concepts, Cyber security policy, procedures, and best practices, Cyber Security technologies: hardware and software, Cyber security, privacy, and risk - awareness and management, Planning, legal, ethical, and professional issues in information security, Cyber security maintenance, personnel, and training, Common attack and defense strategies for software, web applications, networks, operating systems, cryptographic systems and humans will be explored, Cyber Security management concepts, including security operations, risk management, security engineering and security architecture, as well as provide guidance on different career paths specializing in cybersecurity.

CYS 706 Information Sec. Eng., Management and Evaluation (3 Units)

Principles of applied information security management. Governance and security policy. Threat and vulnerability management. Incident management. Risk management. Information leakage. Crisis management and business continuity. Legal and compliance. Security awareness and security implementation considerations. ISO 27000 series and the Plan-Do-Check-Act model. Assessment of threats and vulnerabilities. Incident response. Forensics and investigations. Risk assessment and risk management frameworks. Dealing with classified/ sensitive data. Contingency planning. Legal and regulatory drivers and issues. Certification, common criteria, security awareness. Risk. Significance of risk assessment and management. Cyber risk assessment and management. Risk governance. Significance of risk governance. The human factor and risk communication. Security culture and awareness. Enacting Security Policy. Risk assessment and management principles. Component vs. Systems Perspectives. Elements of Risk, Risk assessment and management methods. Vulnerability management. Risk assessment and management in cyber-physical systems and operational technology. Security Metrics. Business continuity: incident response and recovery planning. Risk Management.

CYS 707 Linux Programming for Cyber Security (3 Units)

Introduction, Distributions and Key Components, Working on the Command Line, Getting Help, Editing Files, When Things Go Wrong, Managing Group Accounts, Managing User Accounts, Develop an Account Security Policy, File Permissions, Manage Local Storage: Essentials, Manage Local Storage: Advanced Features, Manage Network Storage, Develop a Storage Security Policy, crontab and at, Scripting, Common Automation Tasks, Develop an Automation Security Policy, Networking Basics, Network Configuration, Network Service Configuration: Essential Services, Network Service Configuration: Web Services, Connecting to Remote Systems, Develop a Network Security Policy, Process Control, System Logging, Red Hat–Based Software Management, Debian-Based Software Management, System Booting, Develop a Software Management Security Policy, Footprinting, Firewalls Intrusion Detection.

CYS 708 Ethical Hacking and Reverse Engineering (3 Units)

Introduction to ethical hacking, attacks, threats, hackers, measures and countermeasures. Overview of ethical hacker strategies. Focus on how perimeter defences work, how intruders escalate privileges and methods of security systems. Intrusion detection, policy creation, social engineering. Techniques and technologies for understanding the operation of malicious software and attacks. Threats and defence mechanisms. Attack phases. Secure network infrastructure. DDoS attacks, buffer overflows and virus creation. Network Infrastructure Attacks, Hacking Methodology, Developing ethical hacking plans. Footprinting and reconnaissance. Scanning Networks. Enumeration and system hacking. Malware threats. Sniffing. Social engineering. Physical security. Password vulnerabilities - cracking passwords. Denial of Service. Session hijacking. Hacking web servers. Hacking web applications. sql injection, hacking wireless networks. Hacking mobile platforms. Evading IDS, Firewalls, and Honeypots. Techniques and Technologies for understanding the operation of

malicious software and attacks. Techniques for detection, identification and prevention. Reverse engineering of code and network exploits.

CYS 709 Mathematics For Cybersecurity (3 Units)
Axioms Pi and P2. Classical Implicational Calculus. Derived Rules. Proofs of Implicational Theorems. Proofs by Contraposition. Proofs with Axiom. Proofs by Reduction Ad Absurdum. Other Connectives. Definitions of Other Connectives. Other Forms of Deductive Reasoning. Conjunctions of Implications. Predicate Calculus. Predicates Quantifiers. Free or Bound Variables. Axioms and Rules for the Predicate Inference with Quantifiers. Proofs with Universal Quantifiers and other Connectives. Proofs with Restrictions on a Quantified Variable. Sets and Subsets. Equality and Extensionality. Empty Subsets and Supersets. Pairing, Power, And Separation. Unions and Intersections of Cartesian Products and Relations. Mathematical Composite and Inverse Functions. Equivalence Relations. Reflexive, Symmetric, Transitive, or Anti-Symmetric Relations. Ordering Relations. Mathematical Induction. Arithmetic with Natural Numbers. Orders and Cancellations. Rational Numbers. Finite and Infinite Cardinality. Arithmetic in Finance. Logics for Scientific Reasoning. Incompleteness. Logics not Amenable to Truth Tables. Automated Theorem Proving. Transfinite Methods. The Euclidean Algorithm. Digital Expansion and Arithmetic, Modular Arithmetic. Modular Codes Euclid, Euler and Fermat's Theorems. Fermat's Little Theorem. Further Issues in Number Theory. Algebra. Permutations. Signatures of Permutations. Combinations. Probability.

CYS 710 Enterprise and Perimeter Security (3 Units)
Identity. Attributes. Access and Privilege. The Cloud. The Network. Claims-Based Authentication. Credentials for Access Claims. Claims Creation. Invoking an application. Cascading Authorization. Federation. Content Access Control. Delegation. The Enterprise Attribute Ecosystem. Database Access. Building Enterprise Software. Vulnerability Analyses. An Enterprise Support Desk. Network Defense. Perimeter security (Firewalls, IDS, IPS, VPN, proxy servers). Enterprise security policies. Device Security on large-scale distributed networks. Students will participate in hands-on experiments and demonstrate their understanding of subject matter via writing and presentations.

CYS 721 Introduction to Machine Learning (3 Units)
This course covers the core concepts, theory, algorithms and applications of machine learning, Supervised Learning topics such as classification (Na ve Bayes, Logistic regression, Support Vector Machines, neural networks, k-NN, decision trees, boosting) and regression (linear, nonlinear, kernel, nonparametric) as well as Unsupervised Learning (density estimation, MLE, MAP, clustering, PCA, dimensionality reduction).

CYS 722 Digital Forensics and Investigation Methods (3 Units)
Overview of digital investigation and digital evidence, Data Acquisition of physical storage devices, Study of file systems with a main focus on Microsoft Windows & Linux Systems, File System Analysis & file recovery, File carving & document analysis, Information hiding & steganography, Time, registry & password recovery, Email & database forensics, Memory acquisition

CYS 723 Cybercrime (3 Units)
Understanding Cybercrime, Cyber law, Tools and techniques of cybercrime, Cybercrime victimisation, Costs and harms of cybercrime, Criminal marketplaces, Cybercrime offenders and offender pathways, Cybercrime prevention (situational and social approaches), Regulation and policy, Cybercrime and the criminal justice system.

CYS 724 Cloud Computing Security (3 Units)
Course Introduction, Cloud Computing Security,
Governance, and Risks, Security Threats and Challenges in Cloud Computing, Security Management in Cloud Computing, Legal, Contractual, and Operational Monitoring in Cloud, Network Security Management in Cloud, Business Continuity, Disaster Recovery, and Capacity/Performance Planning, Advanced Cloud Security Management Practices, Security Planning, Standards, and Cloud Evolution, Business Continuity, Disaster Recovery, and Capacity/Performance Planning, Advanced Cloud Security Management Practices, Security Planning, Standards, and Cloud Evolution

CYS 725 Bus Continuity, Disaster Recovery, and Incident Management (3 Units)
Introduction to Disaster Recovery and Business Continuity. Different types of disasters and how to recover from them. Difference between disaster recovery and business continuity. Laws and Acts. Laws and regulations relevant to disaster recovery. Disaster Recovery Planning and Implementation. System security, in order to prevent disasters in the first place, and planning for disaster recovery. Business Continuity Management (BCM), Fundamentals of business continuity management, Business Continuity Plans,

Managing, Assessing, and Evaluating Risks. Importance of risk management. Various risk management methodologies, Information Systems Security office (ISSO), Risk Control Policies and Countermeasures. System security and change control policies, Configuration management. Data Storage Technologies. Data Storage Technologies, network attached storage, direct attached storage, and storage area networks. Disaster Recovery Services and Tools. Importance of backing up data and how to implement effective and efficient data backup procedures. Certification and Accreditation of Information Systems.

CYS 726 Systems Vulnerability Testing and Assessment (3 units)
Definition of systems vulnerability. Methods and the testing methods using different techniques. Mitigation of risks and how to enhance the security of a company's infrastructure. Penetration testing methodologies, test planning and scheduling. Information gathering. Password cracking. Penetration testing and security analysis. Social engineering, Internal and external penetration testing. Router penetration testing, security analysis, reporting and documentation. Operating systems fingerprinting. Remote network mapping. Software and operational vulnerabilities. Attack surface analysis. Fuzz testing. Patch management. Security auditing.

CYS 727 Introduction to Cryptography (3 units)
Basic Definitions and Notations, Caesar Cryptosystem, Subsitution Cryptosystem, Vigenere Cryptosystem, Four square Cryptosystem, Hill Cryptosystem, Perfect security in Cryptosystem, Verman one Time pad, Shanon's Theorem and its applications, Key exchange Problem, Diffie-Helleman problem and Key exchange Algorithm, Public key Cryptosystem, Elgamal Cryptosystem, Naive, Fermat and Millar-Rabin Test, RSA Cryptosystem, Hastad's Broadcast Attack, Common Modules Attack, Wiener's Attack, Merkle–Hellman Knapsack Cryptosystem, Basics on Elliptic curves, Cryptosystems using Elliptical curves, Image encryption technicques using Matlab

CYS 728 Cyber Threat Intelligence and Conflicts (3 units)
Techniques for detecting, responding to and defeating organised cybercrimes and cyberwar activities. Analysing successful and unsuccessful advanced persistent threats and malware campaigns. Analysis of divergent national and international policies for combating cyber terrorism and terrorist tactics worldwide. Understanding Cyber threat intelligence, Defining threats, Understanding risk, Cyber threat intelligence and its rule, Expectations of organisations and analysts, Indicators of Compromise. Tactical threat intelligence. Role of a tactical threat intelligence analyst, expected skills and tradecraft. The Kill Chain and Intrusion Analysis. Indicator lifecycle. Introduction to operational threat intelligence - Role of an operational threat intelligence analyst, Need for information sharing and peers. Models and methods for managing intelligence, Campaigns and threat actors. Introduction to strategic threat Intelligence - role of a strategic threat intelligence analyst. Threat modelling, Organisational change and security posturing. Event recording and incident sharing. Evolution of counterterrorism and cyber conflict.

CYS 729 Biometric Security (3 units)
General overview of biometric systems -Design of biometric systems -Authentication vs. Identification Performance analysis -Biological characteristics: Fingerprint, vein, face, iris, periocular -Behavioural characteristics: Keystroke dynamics, gait, signature, voice -Multimodal biometrics -Continuous biometric authentication -Biometric sample quality -Privacy and template protection -Presentation attacks: artefacts and possibilities for mimicking -Biometric standards - Biometric applications

CYS 799 PGD Research Project (6 units)
Candidates shall be required to submit a written project report under staff supervision to the department for examination.

CURRICULUM FOR MASTER OF TECHNOLOGY M.TECH. PROGRAMME IN CYBER SECURITY

1. PROGRAMME OFFERED: Master of Technology (M. Tech) in Cyber Security

2. **AVAILABLE OPTIONS/SPECIALIZATIONS**

i) Cyber Security Engineering

ii)Cyber Security Governance, Framework and Standards

iii) Cyber Security Operations

iv) Cyber Threat Intelligence

v) Cyber Security Risk Management

3. PROGRAMME PHILOSOPHY

The main goal of M.Tech. Cyber Security is to prepare professionally trained graduates for the universities, industries and government establishments. It has been designed to offer graduates the opportunity to develop a deeper understanding of cyber security as a discipline. The focus within this programme on the principles, technologies and practices of cyber security helps graduates to gain the appropriate skills for future PhD studies and research careers as well as to become competent practitioners. The programme comprises particular developments in security with a firm base in academic research and also offers the opportunity for graduates to study selected topics in advanced Cyber Security.

4. PROGRAMME OBJECTIVES

The objectives of the program are to:

i) develop and provide academic and professional training in all areas of Cyber Security for the development of latent power of thinking in individuals;

ii) provide and promote sound practical and theoretical training in Cyber Security as foundation for research and technological development and for the purpose of job placement in Nigeria;

iii) provide students with adequate knowledge in Cyber Security to solve real-life problems in areas of Information Technology, Telecommunication, Finance, Defence, Government and other disciplines that require the knowledge of Cyber Security; and

iv) develop manpower that can identify the basic scientific and technological problems in area of Cyber Security and find appropriate solutions to them.

5. PROGRAMME JUSTIFICATION

The M.Tech. Cyber Security programme will draw graduates wishing to enhance their undergraduate studies in computing with advanced study of security to equip them for senior positions with responsibility for the IT technical and management-based security of an organisation. In addition, the programme encourages those with relevant industry skills to specialise in cyber security or refine and develop their existing expertise. The dynamic nature of statistical training makes it crucial to conduct periodic review of its curriculum. The field of Cyber Security has continued to witness increasing expansion as new areas and new techniques are developed. Hence, the courses have to be in tune with the latest developments in the subject and also take cognizance of the newer methods of statistical analysis which are now totally computerized. In addition, demand for products of the programme has risen in recent times because of the increase in the number of private and public tertiary institutions offering Cyber Security in the country. The graduates of the programme provide the requisite manpower for these institutions. Thus, it has become inevitable to make the programme respond to the needs of both academics, researchers in training institutions, and practitioners in industries.

6. ADMISSION REQUIREMENTS:

To be eligible for admission, candidates must possess any one of the following:

i. B. Tech degree in Cyber Security from FUTA or any other recognized University with a minimum of Second-Class Lower Division, or

ii. Bachelor's degree in related disciplines from FUTA or any other recognized University with a minimum of Second-Class Upper Division. Sufficient background in Cyber Security may be may be an advantage.

iii. HND in related discipline with a minimum of upper credit, or third class bachelors degree plus a PGD in Cyber Security from FUTA or any other recognised University, with a minimum of upper credit (CGPA of 3.5/5.0)

7. PROGRAMME DURATION

The M. Tech. in Cyber Security programme is expected to last for a minimum of 18 months and a maximum of 24 months for full time students only.

8. GRADUATION REQUIREMENTS

To be eligible for the award of M. Tech. Degree in Cyber Security, a candidate must have:

i) passed all core courses and successfully completed the project work
ii) passed a minimum of 46 credit units, made up as follows:
   a) 36 credit units in core courses including seminars and dissertation depending on the options 2(i)- (v)
   b) 12 credit units in elective courses from the major area of specialization.
iii) fulfilled all other conditions as approved by the School of Postgraduate Studies and the University

In addition, the candidate after carrying out satisfactorily a supervised project in any chosen specialization area of Cyber Security, must submit the required number of copies of dissertation; and pass satisfactorily an oral examination on the dissertation before a panel of examiners.

9. COURSE OUTLINE

First Semester (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 801	Special Topics in Cyber Security	2	1	0	3
CYS 803	Machine Learning Techniques For Cyber Security	2	1	0	3
CYS 805	Applied Cryptography	1	0	6	3
CYS 807	Research Methodology	2	1	0	3
	At least six credit units of elective courses				6
Total					**18**

First Semester (Electives courses): Students are to take at least 6 credit course units

(i) Cyber Security Engineering

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 821	Identity and Access Management System	2	1	0	3
CYS 823	Software Security	2	1	0	3
CYS 825	Cloud Security	2	1	0	3
CYS 827	Systems and Application Security	2	1	0	3

(ii) Cyber Security Governance, Framework and Standard

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 831	Information Security Governance	2	1	0	3
CYS 833	Cyber Security Compliance	2	1	0	3
CYS 835	Information Security Programme development	2	1	0	3
CYS 837	Information Security Programme Management	2	1	0	3

(iii) Cyber Security Operations

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 841	Intrusion Detection and Prevention	2	1	0	3
CYS 843	Incident Response	2	1	0	3
CYS 845	Data Leakages and Breaches	2	1	0	3
CYS 847	Human Factors in Cyber Security	2	1	0	3

(iv) Cyber Security Threat Intelligence

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 851	Cyber Threat Hunting	2	1	0	3
CYS 853	Cyber Threat Intelligence	2	1	0	3
CYS 855	Cyber Threat Intelligence Collection and Application	2	1	0	3
CYS 857	Cyber Threat Attribution and Professionalism	2	1	0	3

(v) Cyber Security Risk Management

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 861	Social Engineering	2	1	0	3
CYS 863	Blue Team	2	1	0	3
CYS 865	IT Security Auditing	2	1	0	3
CYS 867	Red Team	2	1	0	3

Second Semester (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 802	Advanced Network Security	**2**	**1**	**0**	**3**
CYS 804	Hacking Techniques and Countermeasures	**2**	**1**	**0**	**3**
CYS 806	Information Security Ethics and Policies	**2**	**1**	**0**	**3**
CYS 808	ISO27000 Framework (Information Security Management)	**2**	**1**	**0**	**3**
	At least six credit units of elective courses				6
Total					18

Second Semester (Elective courses): Students are to take at least 6 credit course units

First Semester (Electives courses): Students are to take at least 6 credit course units

(vi) Cyber Security Engineering

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 822	Data Protection	2	1	0	3
CYS 824	Cyber Security Architecture	2	1	0	3
CYS 826	Advances in Cryptography and Steganography	2	1	0	3
CYS 828	System Administration	2	1	0	3

(vii) Cyber Security Governance, Framework and Standard

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 832	Cyber Security Incident Management	2	1	0	3
CYS 834	Incident Management Operations	2	1	0	3
CYS 836	Cyber Laws and regulations	2	1	0	3
CYS 838	Cyber Security Standards	2	1	0	3

(viii) Cyber Security Operations

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 842	Vulnerability Management	2	1	0	3
CYS 844	Disaster Recovery and Business Continuity	2	1	0	3
CYS 846	Active Cyber Defense	2	1	0	3
CYS 848	Digital Forensics and cyber-Investigation	2	1	0	3

(ix) Cyber Security Threat Intelligence

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 852	Cyber Threat Intelligence for IoT	2	1	0	3
CYS 854	Nature of Cyber Threat	2	1	0	3
CYS 856	Future Threats	2	1	0	3
CYS 858	Threat Environment	2	1	0	3

(x) Cyber Security Risk Management

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 862	Penetration Testing	2	1	0	3
CYS 864	Cyber Security Risk Assessment and Management	2	1	0	3
CYS 866	Threat Assessment and Monitoring	2	1	0	3
CYS 868	Zero Trust Security	2	1	0	3

Third Semester (Compulsory courses for all options)

COURSE CODE	COURSE TITLE	L	T	P	U
CYS 899	Master's Dissertation	0	0	36	12

10. COURSE SYNOPSES

CYS 801 Special Topics in Cyber Security
(3 Units)

A study of the current trends and popular recent researches in Cyber Security will be the focus of this course.

CYS 802 Advanced Network Security (3 Units)

Security problems on a topology level, Zone model, Security classification, Segmentation, Typical security problems of Ethernet, Sniffing, ARP Interception, Man-in-the-Middle Attacks, Wireless LANs, Attacks and Counter measures, Up-to-date technology,Security in Enterprise Networking, Typical security problems in large networks, House of Security, Typical measures and their prioritization VLANs and Security Aspects,VLAN-Hopping, VLANs with Authentication, Control Plane Protocols, Impact on Security, Spanning Tree, CDP, HSRP, VTP, DTP, Security of Routing Protocols, RIP, OSPF, EIGRP, BGP, WAN / Remote Access, GRE, IPsec, Attacks against VPNs, Security of Network Devices, Services, Functions, Modules, Access Control (RADIUS, TACACS+, Kerberos), 802.1x based Access Control, Secure Management, Security problems of SNMP, Functionality of SNMPv3, Logging & Log Analysis, NTP, Transport Technologies, Security Consideration, MPLS Security Functions, VPNs with MPLS, EoMPLS, L2-MPLS, L3-MPLS, Voice over IP, Security aspects and attacks, Isolating VoIP using MPLS, VOIP Hopping, SIP Attacks, H.323 Attacks, Multicast, Securing Multicast-Traffic, Multicast vs. IPsec, SRTP.

CYS 803 Machine Learning Techniques For Cyber Security (3 Units)

Introduction to Machine Learning, Conceptual and Operational Landscape , Machine Learning as a Concept, Algorithms and Their Application, Models, Methods, Explainability of Machine Learning Data Collection, Pre-processing, Training, Prediction Evaluation and Metrics Fine-Tuning, Quantum Machine Learning Quantum, Computers, Main Notions, Specificity of Quantum Machine Learning, Machine Learning Limitations, Defence, Machine Learning for Cybersecurity, IDS Supporting Human Operators Network Security Packet Parsing-Based Detection, Payload Analysis-Based Detection, AI-Specific Security Issues, Adversarial Attacks on Artificial Intelligence, Defence Methods Against Adversarial Attacks, Development of Safe Artificial Intelligence Systems, Hybrid Defence, Attack, Machine Learning for Malware, Machine Learning Enhancing Cyber Attacks, Phishing, Exploitation, Network Traffic Masquerading, Bots and Botnets, Password Guessing, Ransomware, Crypto mining Malware, Recovery, Cryptanalysis, Forensics Investigation, Attacks Against Hardware, Weaponizing AI, Machine Learning for Weapons Autonomy, AWS Vulnerabilities.

CYS 804 Hacking Techniques and Countermeasures (3 Units)

Vulnerabilities and countermeasures. Preventing sniffing, Social engineering, Extortion techniques by establishing a false link of trust with the target. Human-level vulnerabilities. Denial of Service (DoS/DDoS) attack techniques and tools. Ethical hacking and penetration testing, Ethical hacking, controls, laws and standards in information security, Footprinting and Recognition, Methods of data collection and reconnaissance, Network Analysis, Network analysis techniques and analysis countermeasures, Access (enumeration), System access techniques taking advantage of previously identified vulnerabilities and countermeasures, Vulnerability scanning, Identify security vulnerabilities in the target organization's network, communication infrastructure and endpoints, System hacking, Systems hacking methodology, steganography, steganalysis attacks, Malware Threats, Overview of different types of malware, Auditing of Systems, Malware Attacks, Malware Analysis and Countermeasures, Sniffing, Session hijacking, Web server hacking, Web application hacking, Penetration testing, security audit, vulnerability assessment and penetration testing roadmap, SQL Injection, Wireless Network Hacking, Wireless encryption, wireless hacking tools, and Wi-Fi security tools, Hacking of mobile platforms, Attack vector , Android vulnerability exploitation, mobile security guidelines and tools, Threats to Internet of Things, Cloud computing, Cloud computing concepts.

CYS 805 Applied Cryptography (3 Units)

History of cryptography, probability and algorithms, classical cryptography, encryption with perfect secrecy, one-time pad; Algorithms and complexity theory, modern cryptography principles, one-way functions, trapdoor functions, hard-core bits, construction of a public-key cryptosystem based on general cryptographic primitives, Algorithmic number theory, number theory and cryptographic assumptions, Reductions, proofs by reductions, number theory candidates for cryptographic primitives, public-key cryptosystems from number theory problems; Randomness and pseudo-randomness, Symmetric encryption: fundamental concepts; block ciphers, substitution/permutation networks, Feistel networks, modes of operations, cryptanalysis attacks, key lengths; elliptic curves. Asymmetric encryption: hybrid encryption; Asymmetric encryption: malleable and homomorphic encryption notion and schemes, additional schemes, identity-based encryption; i Digital Signatures, hashing and signing, Hashed RSA, El Gamal and DSA signature schemes, public-key infrastructures, certificates, cryptography in TLS, IPSec and virtual

private networks, PKI implementation challenges, Key protocols: key transport, key agreement, notions and schemes; key management: code obfuscation, application digital rights management; quantum computing, quantum-resistant cryptography; user authentication: password, challenge-response and zero-knowledge protocols; server authentication; digital cash, blockchain, cryptocurrencies.

CYS 806 Information Security Ethics and Policies (3 Units)

Principles of Ethics, Ethical values in a digital world, Ethical decision making, Ethics as applied to the gathering and possession of information, Ethical vs. unethical hacking, Professional organizations, Anti-Hacking Laws, Computer Fraud and Abuse Act, Origins of the CFAA, Views of "Exceeds Authorized Access" and "Without Authorization", Sections of the CFAA, Digital Millennium Copyright Act, Cyberwarfare Policies and procedures, Information classification, Technical baselines, Risk management, Internal and external training, Cybersecurity legal standards and requirements applied to businesses and industries, Trade-offs and challenges balancing security and business need, Compliance, Sarbanes – Oxley, Gramm – Leach – Bliley, Privacy (COPPA) HIPAA / FERPA, USA Patriot Act, Americans with Disabilities Act, Section 508, Payment Card Industry Data Security Standard (PCI DSS), European General Data Protection Regulation (GDPR), Other Federal laws and regulations, State law and regulations, Practical effects of compliance requirements, State, US, and International Standards/Jurisdictions, NIST, ISO, COBIT, SABSA, TOGAF, ITIL, Data Breach Response Management, Internal management of data breach, External management of data breach, Data breach response plans.

CYS 807 Research Methodology (3 Units)

This course covers the fundamental steps and implementation on developing the initial ideas to formal academic writing accordingly. Students will be given the mechanisms on how to transform and digest the literature reviews that leads to the proposed research title. This course helps students to prepare the research proposal for Projects. The theoretical and practical aspects of implementing the proposal will be the milestone of this course.

CYS 808 ISO27000 Framework (Information Security Management) (3 Units)

ISO 27000 series. Standard making-up ISO 27000 series, Categories of Standards in the ISO 27000 series; Standards describing requirements, Standards describing general guidelines, and Standards describing sector-specific guidelines, SO/IEC 27001, ISO/IEC 27002 ISO/IEC 27003 ISO/IEC 27004, ISO/IEC 27005, ISO/IEC 27006, ISO/IEC 27010, ISO/IEC 27017, Code of practice for information controls based on ISO/IEC 27002 for cloud services, ISO/IEC 27019, ISO/IEC 27701, Security techniques – Extension to ISO/IEC 27001 and ISO/IEC 27002 for privacy information management – Requirements and guidelines.

CYS 821 Identity and Access Management System

Introduction, Stakeholders and Business Opportunities, Identity Ecosystem and Key Trends, Challenges in Identity Management, What Is Identity Management, Stakeholders and Their Requirements, Identity Life Cycle, Identity Assurance, Fundamental Technologies and Processes, Credentials, Single Sign-On, Attribute Federation, Privacy, Assurance and Compliance, Standards and Systems, Overview, OASIS Security Assertion Markup Language (SAML), Liberty Identity Web Services Framework, OpenID, Information Card–Based Identity Management, Towards Interoperability, Security Analysis Security Analysis, Privacy Analysis, Challenges, Usability, Access Control, Privacy Protection, Trust Management, Interoperability Challenge, Biometrics

CYS 822 Data Protection (3 Units)

Historical Perspective, Personal Data, Processing, Filing System, Controller, Processor, Special Categories of Personal Data, European Economic Area, Data Subject, Pseudonymization, Profiling, Personal Data Breach, The Data Subject's Consent, Child, Genetic Data, Biometric Data, Recipient, Data Protection by Design, Data Protection by Default, Codes of Conduct, Data Protection Principles, Introduction, Lawfulness, Fairness, and Transparency, Purpose Limitation, Data Minimization, Data Accuracy , Storage Limitation, Integrity, Confidentiality, and Security, Exemptions, Accountability, Data Protection by Design and by Default, Processors, Obtaining Data in a Transparent Manner, Personal Data Relating to Criminal Convictions and Offences, Advice on Processing Special Category Personal Data, Obligations of the Controller and Processor, Privacy by Design and Privacy by Default, Pseudonymization, Privacy Enhancing Technologies, ISO 27001, Security and Outsourcing, Security and Exports, Security Breaches, International Data Transfers, Examples of International Transfers, Scope of Data Transfers, Adequate Level of Protection, Providing Adequacy Safeguards, Binding Corporate Rules, The Derogations, Non-repetitive Transfers, The Rights of

Individuals, Responding to Individuals, Exemptions, The Right of Access, Data Portability, Rectification, Rights to Object, Pre-GDPR Arrangements Sub-processors, Accountability and the Role of the Data Protection Officer, The Accountability Requirement, The Role of the DPO, Accessibility, Expertise and Skill of the DPO, Involvement of the DPO, Necessary Resources, Independence, Data Protection Impact Assessments, Record Keeping, Policies and Procedures, Creating a Data Protection Compliance Programme.

CYS 823 Software Security (3 Units)
Software Security. Identification of threats. SDLC, including the current state of the practice for making the business case for software security. Features of Secure Software, Key resources of attack patterns and assurance cases and explains how to use them throughout the SDLC, Requirements Engineering for Secure Software, describes practices for security requirements engineering, including processes that are specific to eliciting, specifying, analyzing, and validating security requirements. Key practice of misuse/abuse cases., Secure Software Architecture and Design, assessing and validating the specification, architecture, and design of a software system with respect to software security, and reliability, Considerations for Secure Coding and Testing, Key practices for performing code analysis to uncover errors in and improve the quality of source code, as well as practices for security testing, white-box testing, black-box Challenges and practices inherent in the design, assembly, integration, and evolution of trustworthy systems and systems of systems. Guidelines for project managers to consider, recognizing that most new or updated software components, Governance, Managing for More Secure Software, Risk management and project management and for establishing an enterprise security framework.

CYS 824 Cyber Security Architecture (3 Units)
Threat modelling, risk assessment, security design patterns, access control, cryptography, network security, cloud security, and incident response. Frameworks and the Lifecycles, IT lifecycle management, Frameworks, Stakeholders, Security policies, Design a Network Security Architecture, Network segmentation, Network components, Practice: Identify network flows, Industry best practices, Roles and responsibilities, Design a Secure Application Architecture, The application architect, Application architecture goals, Service-oriented architecture (SOA), Modular framework development, Authentication, Patching, Vulnerability testing, Design a Data Security Architecture, Data architecture, Classification of data, Privacy, Database security, Encryption, Big data, Data architecture analysis, Data architecture influences, Design an Access Control Security Architecture, Identity and access management, Access control policy, Access control models, Centralized access control, Bring your own device, Access reviews, Updating a Security Architecture, Impact of change, Life cycle management, Architecture changes, Documenting a Security Architecture, Documentation life cycle, Input documentation, Architecture documentation, Output documentation, Security requirements traceability matrix (RTM), Examine Alternative Architectures, Virtualization, Cloud security architecture,

CYS 825 Cloud Security (3 Units)
The Evolution of Cloud Computing , Cloud Computing Defined, The SPI Framework for Cloud Computing , The Traditional Software Model, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise, Infrastructure Security: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security ,Trust Boundaries and IAM, Why IAM?, IAM Challenges, IAM Definitions, IAM Architecture and Practice, Getting Ready for the Cloud, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management, Security Management In The Cloud, Security Management Standards, Security Management in the Cloud, Availability Management, SaaS Availability Management, PaaS Availability Management, IaaS Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management, Privacy, Data Life Cycle, Key Privacy Concerns in the Cloud, Privacy Protecting, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, International Laws and Regulations, Audit And Compliance, Internal Policy Compliance, Governance, Risk, and Compliance (GRC), illustrative Control Objectives for Cloud Computing, Incremental CSP-Specific Control Objectives, Additional Key Management Control Objectives, Control Considerations for CSP Users, Regulatory/External Compliance, Other Requirements, Cloud Security Alliance, Auditing the Cloud for Compliance

CYS 826 Advances in Cryptography and Steganography (3 Units)
Modern cryptography, with emphasis on practical applications. Topics covered include classical systems, information theory, symmetrical cryptosystems, 2 block ciphers, stream ciphers, DES, AES, hash functions and message authentication and their cryptanalysis; asymmetric cryptosystems, RSA and El-Gamal, ECC,

provable security, key-exchange and management, and authentication and digital signatures. Interactive proofs, zero-knowledge proofs, zero-knowledge proofs of knowledge, non-interactive zero-knowledge proofs, secure protocols, two-party secure computation, multiparty secure computation, and chosen-ciphertext security, Meaning of Steganography. Implementation of Steganography , Application areas of Steganography. Steganography versus Cryptography. Types of Steganography: Text Steganography, Image Steganography, Video Steganography, Audio Steganography, Network Steganography

CYS 827 Systems and Application Security (3 Units)
Access control and information flow (formal models and systems), System security analysis, Secure software development, Vulnerabilities and attack patterns (analysis and detection), Operating systems security (hardware protection, privileges, I/O protection, virtualization), Version control, build control, linter, test frameworks, CI/CD, packaging, Code reviews, fuzzing, static analysis, Attack basics (Buffer memory, memory, stack) and defences, Browser security model, HTTP, content rendering, isolation, communication, navigation, security user Interface and cookies, Session management and user authentication, content security policies, web workers, and extensions, Cross Site Scripting, CSRF and metacharacter vulnerabilities, Basics of databases, access control, privileges and views in Databases, techniques for encrypting sensitive information in databases, threats to ecommerce transactions, protecting data integrity and ensuring accessibility, Logging and recovery, ARIES & logging, key-value database, Docker, PID, Mount, Network, UTS, IPC, User; cgroups; capabilities; seccomp; container image scanning and signing and authorization plugins, Kubernetes, Notary/TUF, SPIFFE, ISTIO, OPA, Core security concepts, platform and trends, Threat categories, system architecture and defenses, Device controls, privacy controls, system security,.

CYS 828 System Administration (3 Units)
Introduction. Policies, Overview, UNIX history and basics, System Startup and Operation, Disk Partitioning and Filesystem Installation, Filesystem and Device Manipulation, Process and Log Analysis, Startup Scripts and Configuration Files, User/Group Security and Permissions, Print Spooling, File Formats and Media Access, Backup, Scheduling Maintenance Functions, Firewalls, Security and Privacy, DNS Service: Concepts and Client Resolver, DNS Service: Configuration, File and Print Service: Concepts and Operation, File and Print Service: Configuration and Cross-Platform Issues

CYS 831 Information Security Governance (3 Units)
Organizing a Computer Security, Incident Response Capability, Events and Incidents, Need for Incident Response, Incident Response Policy, Plan, and Procedure Creation, Policy Elements, Plan Elements, Procedure Elements, Sharing Information With Outside Parties, Incident Response Team Structure, Team Models, Team Model Selection, Incident Response Personnel, Dependencies within Organizations, Incident Response Team Services , Handling an Incident, Preparation., Preparing to Handle Incidents, Preventing Incidents, Detection and Analysis, Attack Vectors , Signs of an Incident, Sources of Precursors and Indicators, Incident Analysis, Incident Documentation, Incident Prioritization, Incident Notification, Containment, Eradication, and Recovery, Choosing a Containment Strategy, Evidence Gathering and Handling , Identifying the Attacking Hosts, Eradication and Recovery, Post-Incident Activity, Lessons Learned., Using Collected Incident Data, Evidence Retention, Incident Handling Checklist, Coordination and Information Sharing, Coordination Relationships, Sharing Agreements and Reporting Requirements, Information Sharing Techniques, Ad Hoc, Partially Automated , Security Considerations , Granular Information Sharing

CYS 832 Cyber Security Incident Management (3 Units)
Security Governance, Information Security Is Important for Business, Information Security Governance, Information Security Management, Using Security Standards, Security Governance Control Framework, Three-Level Control Framework., Strategic Level, Tactical Level, Operational Level, Main Functions of the Model Building Blocks, Strategy, Policies, Organization, Risk Management, Program Management, Security Metrics, Reporting and Oversight, Asset Management, Compliance, Operational Level, Mapping between ISO 27001 and TLCF, Governance Self-Assessment, Impact on Governance, Impact on Governance, Security Strategy, Security Strategy Content, Gap Analysis Using the Maturity Model, Consolidate Improvement Points into Initiatives, Initiatives to Improve Information Security Effectiveness, Grouping of Initiatives and Establishment of a Project Roadmap, Formulation of a Strategy, Security Strategy Communication, Internal Regulatory Framework Principles, Classification of Regulatory Framework Documents, Classification by Document Nature or Hierarchy, Classification by Business Unit or Business Sector, Classification by Domain, Documentation Framework for Internal Regulations, Content of a Security Charter and Policy, Contents of a Security Charter, Content of a Security Policy, Process

of Establishing a Regulatory Framework, Roles and Responsibilities in Information Security (IS), New Demands on the CISO and Their Team, Security Organizational Structures, Operations-Oriented Security, Security, Enterprise Security, Distributed Security, Security Profiles.

CYS 833 Cyber Security Compliance and Auditing (3 Units)

Compliance Frameworks and Industry Standards, Client System Administration, Evolution of Information systems -Roles and responsibilities, Audit, Assessment and review, The Role of the Compliance Officer, The duties and responsibilities of the compliance officer and the function of compliance, Compliance officer activities, The requirements of a Compliance Officer, Drafting compliance reports, Designing an Internal Compliance System, Regulatory principles–Issues, Developing high-level compliance policies, Defining responsibility for compliance, The compliance function, Specific internal compliance control issues–Information System Audit, Scope of System Audit , Audit Planning, Audit Manual, Audit check lists, Audit Reports, Best Practices for IT compliance and Regulatory Requirements. Endpoint Protection and Patching, Server and User Administration, Cryptography and Compliance Pitfalls, Reasons for specific cybersecurity legislation beyond cybercrime, compliance requirements, self-assessment, auditing principles, audit process, Governance, Risk, Compliance, Risk Threshold, Risk Modelling, Risk Appetite, Governance Standards. Best Practices for IT Governance–ITIL - ISO/IEC 27001'.

CYS 834 Cyber Security Incident Management (3 Units)

Malware class incidents - Cyber-attack cycle - Demo-weaponizing MS Office document - Malware analysis tools Incident management key components - Different incident handling workflow (ENISA, NIST, SANS, etc) and current improvements. Processes, Procedures, Standard operating procedure - Incident handling process step by step - Incident categories, triage, RTIR Introduction - Incident triage: initial evaluation of the incident information, classification - Demo- usage cases, dashboards, incident handling workflow, Overview of Incident types, related to email usage: Spam, Phishing, Malware delivery, Distortion emails, Email system architecture and SMTP relay - Comparison of forgery prevention techniques - Email investigation, Overview of log analysis tools - Actionable data provided by Logs. - Log analysis in Linux - SIEM solutions, some tools demo, Website Vulnerabilities and Log Analysis - Website vulnerabilities: CSS/XSS; Code injections ; Remote File Injection; Cross site request forgery (XSRF). - Attack methods and their reflections in the logs. - Tools for vulnerabilities management, Network traffic monitoring - Network traffic data collection and logging (network capture, NetFlow) - Overview of network traffic analysis tools

CYS 835 Information Security Programme Development (3 Units)

Information Security Program Development, Designing an Information Security Program, Information Security Program Details, Information Security Architecture, Security Policies, Working With Internal and External Resources, Understanding Risk, Everything You Always Wanted to Know About Tech, A Cybersecurity Primer, Management, Governance, and Alignment, Your Cybersecurity Program: A High-Level Overview, Assets, Threats, Vulnerabilities, Environments, Controls, Incident-Response Planning, People, Living Cybersecure.

CYS 836 Cyber Security Law and Regulations (3 Units)

Introduction to Cyber Law Evolution of Computer Technology: Emergence of Cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access, Information technology Act : Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication, Cyber law and related Legislation : Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution.

CYS 837 Information Security Programme Management (3 Units)
Introduction to Information security strategy and policy management, Cultural, organizational and behavioural theories used in information security management organizations, Legal and ethical aspects of information security and privacy management, Overview of current information security management standards and practices, How to develop a security program, Introduction to assessing and treating risk, Threat and vulnerability modelling, Management models and management practices, Contingencies and maintenance of Information security, Information security planning and incident management

CYS 838 Cyber Security Standards (3 Units)
Information Security Standards Development and Maintenance, Acceptable Use Standard, Information Resource Privacy Standard, Account Management Standard, Administrative Account Management Standard, Password Management Standard, Data Classification Standard Email Use Standard, Malware Protection Standard, Network Access Standard Mobile Device Standard, Security Awareness Standard Software Licensing Standard, Backup and Recovery Standard Change Management Standard, Incident Management Standard, Intrusion Detection Standard, Network Configuration Standard, Physical Security Standard, System Development Standard, Security Monitoring Standard, Baseline Security Standard, Vendor Access Standard

CYS 841 Intrusion Detection and Prevention (3 Units)
IDS/IPS definition and classification -Basic elements of attacks and their detection, Misuse detection systems (search algorithms and applications in IDS), Anomaly detection systems (machine learning basics: principles, measures, performance evaluation, method combinations, basics of artificial neural networks, clustering (hierarchical and partitional) and supervised learning in IDS), Testing IDS and measuring their performances, Computational complexity-theoretic and information-theoretic IDS models and quality criteria, Intrusion detection in virtual networks, Also included is an analysis of the principles and practices of intrusion detection, intrusion prevention, and incident handling; network-based, host-based, and hybrid intrusion detection; identifying attack patterns; deployment of resources and responses to handle the incident, surveillance, damage assessment, risk assessment, data forensics, data mining, attack tracing, system recovery, and continuity of operation.

CYS 842 Vulnerability Management (VM) (3 Units)
Understanding the Need for Vulnerability Management, The Role of Risk Management, Origins of VM, Introducing the Security Industry and Its Flaws, Challenges from Government and Industry, Sources of Vulnerabilities, Example of Flawed VM, Significance of VM, the Vulnerability experience, The Vulnerability Creation Process, VM Program Failure, Program and organization, Program Structure, The VM Program and Technology Development, Policy and Information Flow, Technology, General Architecture, Agents, Passive Network Analysis, Active Scanning Technology, Hybrid Approach, Inference Scanning , CVE, The Standard for Vulnerability Test Data, The Standard for Vulnerability Severity Rating, CVSS Nomenclature , selecting technology, General Requirements, Automation, Architecture, Customization and Integration, Scoring Method, Access Control, Deployment Methods, The VM Process, Baselines, ITIL-ITSM Processes, IAVA Process, Discovery Reports, Evaluation Reports, Profile Reports, Audit Reports, Active Scanning: Scheduling and Resources, Audit Trend and Performance Reports, Compliance Reports, Charter Development, Business Case, Requirements Document, Security Architecture Proposal.

CYS 843 Incident Response (IR) (3 Units)
Introduction to Incidence Response, GDPR regulations NIS regulations, Components of an incident response plan, Incident Response, Evolution and Current Challenges, The evolution of incident response, The history of data breaches, Modern cybersecurity evolution, Challenges facing incident response, Significance of incident response, Composition of Incident Response Team, Duties of Incidence Response team, Building an Incidence Response Strategy, Security operations and continuous monitoring, Key Metrics for Incident Response, Understanding KPIs, Key metrics for a phishing attack, Incident response metrics in the cloud, Methods and Tools of Incident Response Processes, Incident Handling, The NIST definition of a security incident, The incident response process, Handling an incident, Handling an incident in a phishing scenario, Hands-on phishing incident response, Incident Investigation, Incident investigation essentials, Investigating a phishing attack, Analysis of emails, Investigation tools, Investigating user inboxes, Automatic and scheduled investigations, Incident Reporting, Incident Response on Multiple Platforms, IR on computers, IR on mobile devices, IR on Active Directory, IR in the cloud, Building a Culture of Incident Readiness, Incident Response Best Practices, Adopting proactive mobilization.

CYS 844 Disaster Recovery and Business Continuity (3 Units)
Disaster Recovery and Business Continuity, Operational Cycle of Disaster Recovery, Disaster Recovery Cost, Incidents That Required the Execution of Disaster Recovery Plans, Types of Disasters, Data Breach Investigations Reports, Disaster Recovery, Disaster Recovery Checklist , Best Practices for Disaster Recovery, Business Continuity, Disaster Recovery Versus Business Continuity, Business Continuity and Disaster Recovery Planning, Security Management Plan, Natural Threats to Consider While Preparing a Security Management Plan, Man-Made Threats as Part of a Security Management Plan, Disaster Recovery Planning and Implementation, Aspects of Security, Application Security, Security Issues with Commercial Off-The-Shelf (COTS) Products, Vulnerabilities in Network Security Remanence, Disaster Recovery Plan (DRP), Business Impact Analysis (BIA), Disaster Recovery Roles and Responsibilities, Disaster Recovery Planning Steps, Disaster Preparedness, Profiles, Operations Profile, Application Profiles, Inventory Profile, Notification and Activation Procedures, Damage Assessment Procedure, Response Checklist, Recovery Procedures, Testing and Maintenance Procedures, Alternate Site Requirements, Returning to Normal Operations , Communications Plan, Disaster Recovery Planning in a Virtualized Environment, Business Continuity Management, Crisis Communication Plan, Types of Crises., Communication Guidelines, Emergency Response Plan, Checklist, Emergency Management Team (EMT), Contingency Planning, Preventive Controls.

CYS 845 Data Leakage and Breaches (3 Units)
Data Breach, Unprotected Personal Information, Quantifying Dark Breaches, Undetected Breaches, Dark and Darker Breaches, Cybersecurity Vendor Data, Hazardous Material, Data Is the New Oil, The Five Data Breach Risk Factors, The Demand for Data, Anonymization and Renonymization, Crisis Management, Crisis and Opportunity, The Four Stages of a Crisis, Crisis Communications, or Communications Crisis, Equifax, The Birth of Data Breaches, Smouldering Crisis, Prodromal, Chronic Phase, Resolution Phase, Before a Breach, Leveraging Breached Data, From Fraud to Data Breaches, Selling Stolen Data, Asymmetric Cryptography, Onion Routing, Dark E-Commerce Sites, Cryptocurrency, Modern Dark Data Brokers, Payment Card Numbers , Data Laundering, Payment Card Breaches, The Greatest Payment Card Scam of All, Impact of a Breach, Placing Blame, PCI Data Security Standard, A For-Profit Standard , The Man behind the Curtain, Operation Get Rich or Die Trying, Point-of-Sale Vulnerabilities, Green Hat Enterprises, the New Poster Child, Struggles with Security, TJX Settlements, Data Breach Legislation, The Heartland Breach, PCI and Data Breach Investigations, Retailgeddon, Accident Analysis, An Ounce of Prevention, Target's Response, Ripple Effects, Banks and Credit Unions, Widespread Card Fraud, To Reissue or Not to Reissue, Supply Chain Risks, Service Provider Access, Technology Supply-Chain Risks, Cyber Arsenals, Health Data Breaches, Exposure and Weaponization, Extortion, Epidemic, Denial Extortion, Exposure Extortion, Faux Extortion, Cyber Insurance, Cloud Breaches

CYS 846 Active Cyber Defense (3 Units)
Introduction, Threat Intelligence, Risk Mitigation, Social and Physical Security, Reconnaissance, Enumeration, Vulnerability Management, Identity and Access Management Security (IAM), Cybersecurity Threats, Infrastructure Security, Wireless and IOT Security, Infrastructure Analysis, Software Assurance, Data Analysis, Incident Response Take down Service, Mail Check, Web Check, Protective DNS, Dangling DNS, Routing and Signalling, Host Based Capability, Vulnerability Disclosure, NCSC Observatory, Suspicious Email Reporting Service, Logging Made Easy, Cyber Threat Intelligence Adaptor,

CYS 847 Human Factors in Cyber Security (3 Units)
A Brief History of Cybersecurity, The German Celebrity Hack, The Australian Parliamentary Hack, The Big Picture, Denial of Service, Ransomware, WannaCry, Petya and NotPetya, Check Business Email Compromise (BEC) Attacks, Blockchain Land Titles, Corporate Data Breaches, Supply Chain Attacks, Guard Your CV, The Equifax Hack, Flood Prevention, The Nation State and Cybersecurity: Firewalls, Friends, and Enemies, Social Credits, Encryption: Law of the Land versus Law of Mathematics, Trampling over Transport Layer Security, Beware the Insider, Networks and Norms, Social Networks, Some Elementary Graph Theory, Scale-Free Networks, Network Motifs, Social Norms, Emergent versus Agreed Norms , Some Adverse Social Norms in Cybersecurity, Data Security, Cyber Hygiene, Distributed Trust, Slack Email, Good and Bad Advice, The Ups and Downs of Virtual Private Networks, Data Fragility, Modularity in Cybersecurity, Cybersecurity as Predicted by Demographics, Cybersecurity and the Theory of Reasoned Action, Motivation To Avoid Harm (MTAH) and Cybersecurity, The Technology Acceptance Model (TAM) and the Adoption of New Technologies in Cybersecurity, Social and Situational Factors in Cybersecurity, Trust and Risk in the Online Environment,

Cybersecurity as Predicted by Personality, Information Overload, Improving the Security Behaviour of Users, Costs and Occurrences of Cyberattacks, Types of Threats and Their Associated Risks, Threats by Source of Attack, Threats by Type of Attack, Legal Frameworks and Their Effects on Reducing Risk, Accreditation and National Frameworks to Reduce Cyber-Risks, CBEST, Framework for Improving Critical Infrastructure Cybersecurity or the National Institute of Standards and Technology (NIST) Framework, Cyber Warfare.

CYS 848 Digital Forensics and Cyber Investigation (3 Units)

Introduction, Forensic science, How to become a digital forensic investigator, Digital forensic approaches and best practices, Digital forensics tool kit, Computer forensics, Internet and e-mail examinations, Mobile forensics, Cloud computing and digital forensics, Law enforcement incident response, Report writing and presentation, Social media forensics, Social engineering forensics, Anti-forensics, Link and visual analysis , Psychological, ethical, and cultural implications of digital forensics, The realities of digital forensic practice, Overview of digital investigation and digital evidence, Data Acquisition of physical storage devices, Study of file systems with a main focus on Microsoft Windows & Linux Systems, File System Analysis & file recovery, File carving & document analysis, Information hiding & steganography, Time, registry & password recovery, Email & database forensics, Memory acquisition.

CYS 851 Cyber Threat Hunting (3 Units)

Introduction to Threat Hunting, Cybersecurity Threat Landscape, Structuring Threat Hunting, Executing the Threat Hunt, Threat Hunting vs Threat Detection, How to develop a threat hunting hypothesis, How to document a threat hunt play, The importance of threat intelligence to threat hunting Building a threat hunting framework, Threat hunting process, Threat hunting role and responsibility, Evaluating the maturity of a threat hunting practice, Building the Foundation of a Threat Hunting Practice, Threat Hunting expedition, Threat Scenario, Threat Intelligence for Threat Hunting, Hunting in Cloud, Using Fundamental Statistical Constructs, Tuning Statistical Logic, Unsupervised Machine Learning with K-Means.

CYS 852 Cyber Threat Intelligence for IoT (3 Units)

Introduction, Taxonomy of IoT Vulnerabilities, Device-Based Vulnerabilities, Network-Based Vulnerabilities, Software-Based Vulnerabilities, Security Impact, Attacks Against Confidentiality and Authentication, Attacks Against Data Integrity, Attacks Against Availability, Remediation, Access and Authentication Controls, Software Assurance, Security Protocols, Situational Awareness Capabilities, Vulnerability Assessment, Honeypots, Network Discovery, Intrusion Detection, Inference of IoT Exploitation, Exploiting Darknet Data, Probing Inference, Correlation with Active Measurements, Generating IoT-Specific Malicious Signatures, Empirical Evaluation, First Empirical Look on Internet-Scale Exploitation of IoT Devices, Characterization and Signature Generation, Generating and Sharing IoT-Centric Cyber Threat Intelligence, Server Core Function, Data Aggregation Module, Data Processing Module, Auxiliary Functions, Client-Side Core Components, Performance Evaluation.

CYS 853 Cyber Threat Intelligence (3 Units)

Introduction. Threats. Threat intelligence. Meaning of Cyber Threat Intelligence. Identifying the Wheat from the Chaff, Systems and Services for Monitoring Threats, Major Threats to Businesses, The Intelligence Cycle, Planning and Direction, Collection, Processing and Exploitation, Analysis, Dissemination, The Diamond Mode, Diamond Model Adversary Diamond Model, Victim Diamond Model Infrastructure, Diamond Model Capabilities/TTPs, The Cyber Kill- Chain and MITRE ATT&CK Framework, The Cyber Kill-Chain, Structured Intelligence, OpenIOC, MITRE ATT&CK, Using MITRE ATT&CK, STIX, Aligning STIX with ATT&CK, Threat Actor Campaign Attack Pattern, Malware Vulnerability Course of Action Victim, Tactical Intelligence, Operational Intelligence, Strategic Intelligence, Other Types of Intelligence Reporting, Intelligence Report Structure, OSINT. The Importance of OSINT. Different Types of OSINT, Data Platforms, Threat Feeds Research Platforms Social Media Messenger Platforms, OSINT – Technologies, OSINT – Threat Actors, OSINT – Data.

CYS 854 Nature of Cyber Threat (3 Units)

Introduction to Cyber Threats, Cyber incident identification, analysis, and response. Common Sources of Cyber Threats Nation states, Terrorist organizations, Hackers, Malicious insiders, Types of Cybersecurity Threats, Viruses, Worms, Trojans, Ransomware, Cryptojacking, Spyware, Adware, Fileless malware, Social Engineering Attacks. Social engineering, Baiting, Pretexting, Phishing, Vishing, Smishing, Piggybacking, Tailgating, Supply Chain Attacks, Man-in-the-Middle Attack, Wi-Fi eavesdropping, Email hijacking, DNS spoofing, IP spoofing, HTTPS spoofing, Denial-of-Service Attack, HTTP flood DDoS, SYN flood DDoS, UDP flood DDoS, ICMP flood, NTP amplification,

Injection Attacks, SQL injection, Code injection, OS command injection, LDAP injection, XML eXternal Entities (XXE) Injection, Cross-Site Scripting (XSS), cyber terrorism, cyber espionage, cyber stalking, cyber identity management, cyber privacy, among others.

CYS 855 Cyber Threat Intelligence Collection and Application (3 Units)

Planning Intelligence Gathering, The Intelligence Programme, Principles of Intelligence, Intelligence Metrics, The Intelligence Cycle, Planning, Requirements, and Direction, Collection, Analysis and Processing, Production, Dissemination, Situational Awareness, Target Breach, Goal Oriented Security and Threat Modelling, Strategic, Operational, and Tactical Intelligence, Strategic Intelligence, Lazarus Group, Operational Intelligence, Example –SamSam, Tactical Intelligence, Example –WannaCry, Sources of Intelligence Reports, Example Shamoon, Incident, Preparedness and Response, Preparation, Hierarchy of Evidence, Example –Smoking Tobacco Risk, Understanding Intelligence, Expressing Credibility Expressing Confidence, Understanding Errors, Example –the WannaCry, Email, Example – the Olympic Destroyer False Flags, Third Party Intelligence Reports, Tactical and Operational Reports, Example – Heartbleed Strategic Threat Reports, Internal Incident Reports, Root Cause Analysis, Active Intelligence Gathering Example –the Nightingale Floor, Example – the Macron Leaks

CYS 856 Future Threats (3 Units)

Emerging Technologies, Smart Buildings, Software Errors, Example – Maroochy Shire Incident Health Care, Example –Conti Attack Against Irish. Evolutions, Criminal Threat Actors, NationState Threat Actors, Other Threat Actors, Emerging. Workforce, Job Roles and Skills, Diversity in Hiring, Growing the Profession.

CYS 857 Cyber Threat Attribution and Professionalism (3 Units)

Holding Perpetrators to Account, Punishment, Legal Frameworks, Cyber Crime Legislation, International Law Crime and Punishment, Standards of Proof, Forensic Evidence, Mechanisms of Attribution, Attack Attributes, Attacker TTPs, Example–HAFNIUM, Attacker Infrastructure, Victimology, Malicious Code, Asserting Attribution Anti-Attribution Techniques, Infrastructure, Malicious Tools, False Attribution, Chains of Attribution, Third Party Attribution, Using Attribution, Notions of Professionalism, Professional Ethics, Developing a New Profession, Professional Education Professional Behaviour and Ethics, Professionalism in Medicine, Professionalism in Accountancy, Professionalism in Engineering, Certifications and Codes of Ethics, Behaving Ethically, The Five Philosophical Approaches, The Josephson Model, PMI Ethical Decision Making Framework, Legal and Ethical Environment, Planning, Responsible Vulnerability Disclosure, Vulnerability Hoarding, Collection, Analysis, and Processing, PRISM Programme, Openand Closed Doors, Dissemination, Doxxing, Managing the Unexpected, Continuous Improvement

CYS 858 Threat Environment (3 Units)

Introduction to Threat Environment, Threat Classification, Risk and Vulnerability, Human Vulnerabilities, Example –Business Email Compromise, Configuration Vulnerabilities, Example – Misconfiguration of Cloud Storage, Software Vulnerabilities, Example Log4j, Vulnerabilities, Threat Actors, Example – Operation Payback, Example – Stuxnet, Vulnerabilities, and Exploits, Email Attack Vectors, Web-Based Attacks, Network Service Attacks, Supply Chain Attacks, The Kill Chain, Untargeted versus Targeted Attacks, Persistence, Thinking Like a Threat Actor

CYS 861 Social Engineering (3 Units)

Social Engineering, Understanding the Breadth of Social Engineering as a Weapon, Social Engineering Fraud Schemes, The Cyber Underground, The Basic Steps to Countering Phishing Attacks, A New Level of Social Engineering for the 21st Century, What Social Engineering Attackers Want, Common Types of Fraud, Socially Engineered Larger-Scale Investment Scams, Ways Social Engineering Attackers Work, The Tech Support Scam, Business Email Compromise, Social Engineering of Education Scams, The Avalanche Takedown, Takedown of the Gameover Zeus and Cryptolocker Operations, Social Engineers are Striking on Numerous Fronts, The North Korean Connection, The Basics of Security for Social Engineering Attacks, Applying the Cybersecurity Framework is an Ongoing Process, T Developing Security Policies, Protecting Small Businesses from Social Engineering Attacks, Establishing a Culture of Security, Social Engineering Patterns in Politics, Social Engineering Political Messages, Social Engineering People, The Nature of the Insider Threat, National Security and Social Engineering Threats, The National Insider Threat Task Force, Social Engineering Attacks on Businesses, Basic Steps to Protect Against Insider Threats, Social Engineering Attacks Come in Many Shapes and Sizes, Neutralizing Click Bait by Educating Internet Users, Preventing

Radicalization of Individuals, The Evolution of Cyber Threats and Vulnerabilities, Nationwide Cybercrime Sweeps, The Man Who Knew About Social Engineering and Fraud, Law Enforcement Training on Cybercrimes,

CYS 862 Penetration Testing (3 units)
Introduction to Penetration Testing, Information Security, Limitations of Penetration Testing, Testing Types, Who Does Pen Testing, Methodology, Digging for Information, Google Hacking, Social Networking, Internet Registries, What's Open?, Domain Name System, Transport Protocols and Ports, Port Scanning, TCP Scanning, UDP Scanning, Operating System and Version Scanning, High-Speed Scanning, Grabbing Banners, Vulnerabilities, Meaning of Vulnerabilities, Vulnerability Scanners, Scanning for Vulnerabilities, Fuzzing, Exploitation, Getting Control, Finding a Vulnerability, Using Metasploit, Metasploit Auxiliary Modules, Debugging, Exploit Database, Social Engineer's Toolkit, Post-Exploitation, Breaking Web Sites, Web Architecture, Business Logic and Data, Architecture Protections, Asynchronous Javascript and XML (AJAX), Common Web Application Attacks, Cross Site Scripting, SQL Injection, Command Injection, XML External Entity Attacks, Clickjacking Attacks, Cross Site Request Forgery, Evasion Attacks, Testing Strategies, Automated Tools, Passive Scanning, Practice Sites, Reporting.

CYS 863 Blue Team (3 Units)
Blue Team, Establishing a Defense Program, Organizational benefits from implementation of blue teaming approaches, A blue team's composition, Red team, Purple team, Cyber threat intelligence, Skills required to be in a blue team, Why must organizations consider metricizing cybersecurity? Blue team KRIs, Selecting essential cybersecurity metrics, Why and how organizations can automate this process, What pitfalls to avoid when automating the workflows of the blue team, Automating how KRIs are collected and presented Summary, Blue Team Operations, Understanding defense strategy, Blue team operations – infrastructure Blue team operations – applications Blue team operations – systems, Blue team operations – endpoints, Blue team operations – cloud, Defense planning against insiders Responsibilities in blue team operations Summary, Cyber threats, The Cyber Kill Chain Phase. Phases of the Cyber Kill Chain. Different types of cyber threat actors, Impacts of cybercrime, An approach to security that is proactive rather than reactive Summary , Governance, Compliance, Regulations, and Best Practices, Controlling the Fray, Preventive Controls, Detective Controls, Prioritizing and Implementing a Blue Team Strategy, Emerging detection and prevention technologies and technique, Adversary emulation VCISO services Context-aware security Defensive AI, Extended Detection and Response (XDR) Manufacturer Usage Description (MUD), Zero Trust, Pitfalls to avoid while setting up a blue team Getting started on your blue team journey Summary

CYS 864 Cyber Security Assessment and Management (3 Units)
Definition of cybersecurity risk and associated terminology, risk analysis and management in relation to the other components of a cybersecurity programme. Principles: Assets, vulnerabilities, threats, threat actors, likelihood. Management of risks compared to simple acceptance. Risk treatment options: avoidance, mitigation, transfer, acceptance. Assets: Tangible and intangible assets dependencies, potential for critical national infrastructure. Vulnerabilities: Sources of cyber vulnerability, complexity of modern software, attack surface of modern systems, development of software for functionality and not with security considerations, existing known and zero-day system vulnerabilities, vulnerability databases and open information. Threats: Cyber threat categorization, sources, motivation, type, technical vs. non-technical threat actors, exploitation of cyber vulnerabilities leading to impact and associated likelihood. Risk analysis: Risk as a combination of possible impact of a threat exploiting a vulnerability, evaluation of cyber risks, categorization, qualitative and quantitative risk analysis, pre-requisites for meaningful quantitative cyber risk assessment, methodologies, risk register. Risk management: Risk evaluation and associated selection of risk treatment options, effects and selection of risk avoidance, mitigation, transfer, acceptance (or a combination thereof), risk management as an iterative process, risk profile stemming from modifications in an organisation's environment, building an organisation's cybersecurity control environment from the results of risk analysis.

CYS 865 IT Security Auditing (3 Units)
Introduction to Security Auditing, Audit Planning and Preparation, Reasons for Auditing , Audit Principles , Process, Audit competence and evaluation methods,, Reasons for Auditing, Audit Principles, Audit Responsibilities, Audit Time and Process Flow, ISMS audit checklist, Audit Techniques and Collecting Evidence, Auditor Quality and Selection, Audit Script, Audit Stages, Audit Techniques, Collecting Evidence through Questions, Observation, Reporting to Audit Finding, Audit Team Meeting, Nonconformities and Observation, Example of a well-written nonconformity, Corrective and Preventive Actions.

CYS 866 Threat Assessment and Monitoring (3 Units)
Threat Assessment and Monitoring, Introduction to concepts: Threat, Risk, Vulnerability, Relationship between concepts Similarities, Differences Security assessment, Evolution of threat Patterns, Tactics Techniques, Introduction to risk assessment Importance of risk assessment, Hazard identification Data collection, Exposure to danger, Risk analysis, Decision making, Likely impact and effect Risk probabilities, Risk evaluation, Risk characterisation Risk control, Threat, Hazards, Armed attack, Cyberterrorism, Definition of threat, Existence Capability History Targeting Intention, Threat assessment products, Vulnerability assessment Multidisciplinary team Vulnerability assessment preparation Vulnerability reduction, Define function, Identify critical system, Evaluate system interactions, Common system vulnerabilities, Locate components, Determine survivability Document entire process, Vulnerability rating Very high, High Medium-high Medium Medium-low Low, Very low, Introduction to asset value assessment People, Asset value, Identify the core function of the asset Identify infrastructure, Quantifying asset value, Introduction to cybersecurity risk management Information security, Risk assessment, Risk assessment management tools, Case study Risk identification, Log parsing to identify risks Risk management.

CYS 867 Red Team (3 Units)
Red Teams in Security Testing, Red Teaming Organizations, Engagement Planning, Cost and Funding, Scope, Duration, Personnel Labor Cost Equipment and Software Cost Travel Cost, Pre- and Post-Engagement Cost Frequency, Engagement Notifications Roles and Responsibilities Rules Of Engagement (Roe) Managing Risk, Threat Planning, Threat Profile, Creating a Threat Profile by Decomposing a Threat. A Review of a Blackhat's Tradecraft, Threat Perspective, Threat Scenario, Threat Emulation, Scenario Models, Indicators of Compromise, Engagement Concepts, Deconfliction, Data Handling, Engagement Execution, Data Repository, Data Collection Tradecraft, General Guidance, Execution Concepts, Tools and Tool Examples, Command and Control (C2), Engagement Culmination, Sanitization and Cleanup Operator Log, Verification Pre-Report Briefings, Engagement Reporting, Attack Flow Diagrams, Observations versus. Findings, Risk Rating and Metrics, Risk Matrices Comparison, Attack Narrative

CYS 868 Zero Trust Security (3 Units)
Introduction to Zero Trust Security, Zero Trust vs traditional perimeter security?, Why do we need Zero Trust Security?, Zero Trust Architectures, Zero Trust in Practice, Zero Trust and Enterprise Architecture Components, A Zero Trust Policy Model, Zero Trust Scenarios, Making Zero Trust Successful, Why is the Zero Trust Model Important?, Understanding micro Segmentation, Implementing a perimeterless Design, Identity management for Zero Trust Security, The Pillars of Zero Trust Security, Device Trust, User Trust, The five steps to a Zero Trust network, How to architect a Zero Trust network, A look at some vendor implementation of Zero Trust Security Model, Zero Trust Security in the Cloud using Cloud Access Security Broker (CASB).Introduction, Software as a Service, IoT Devices and "Things", A Zero Trust Policy Model, Zero Trust Scenarios, Making Zero Trust Successful.

CYS 899 Master's Dissertation (12 units)
An independent investigation of an appropriate computing research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organised and well-written form. The candidate is required to present at least two seminar papers before the final oral presentation. The thesis is examined in a viva voce.

CURRICULUM FOR MASTER OF PHILOSOPHY (M. PHIL) PROGRAMME IN CYBER SECURITY

1. PROGRAMME OFFERED: Master of Philosophy in Cyber Security

2. PROGRAMME PHILOSOPHY

The main goal of M.Phil. Cyber Security is to prepare professionally trained graduates for the universities, industries and government establishments. It has been designed to offer graduates the opportunity to develop a deeper understanding of cyber security as a discipline. The focus within this programme on the principles, technologies and practices of cyber security helps graduates to gain the appropriate skills for future PhD studies and research careers as well as to become competent practitioners. The programme comprises particular developments in security with a firm base in academic research and also offers the opportunity for graduates to study selected topics in advanced Cyber Security.

3. PROGRAMME OBJECTIVES

The objectives of the program are to:

i) develop and provide academic and professional training in all areas of Cyber Security for the development of latent power of thinking in individuals;

ii) provide and promote sound practical and theoretical training in Cyber Security as foundation for research and technological development and for the purpose of job placement in Nigeria;

iii) provide students with adequate knowledge in Cyber Security to solve real-life problems in areas of Information Technology, Telecommunication, Finance, Defence, Government and other disciplines that require the knowledge of Cyber Security; and

iv) develop manpower that can identify the basic scientific and technological problems in area of Cyber Security and find appropriate solutions to them.

4. PROGRAMME JUSTIFICATION

The field of Cyber Security is dynamic and always experience new inventions in the face of new challenges in the field of Information Technology, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Moreover, the demand for Cybersecurity programme has risen in recent times due to these evolving discoveries. In view of the above considerations, the department of Cybersecurity is proposing the M. Phil. Cybersecurity programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

The requirements for admission into the M.Phil. programme shall consist of:

(i) M.Tech. or M.Sc. in Cybersecurity from FUTA or related fields from other institutions with a CGPA of between 2.4 and 2.99 on a 5-point credit scale and a 50 -54%;

(ii) All applications for the M.Phil. programme shall be subjected to the School of Postgraduate Studies regulations.

6. PROGRAMME DURATION

The M.Phil. in Cybersecurity programme is expected to last for a minimum of 18 months and a maximum of 24 months.

7. GRADUATION REQUIREMENTS

To be eligible for the award of MPhil. degree in Cybersecurity, a candidate must have:

i. passed all the core courses and electives;
ii. accumulated a minimum of 15 course units and 6 research units;
iii. successfully presented at least two seminars – proposal and progress seminars;
iv. fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University; and
v. successfully completed and defended a research thesis in an oral examination.

All the courses indicated in each of the tables given below are core and required for MPhil degree in Cyber Security

M.Phil. FIRST SEMESTER COURSES

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
CYS 891	C	Special Topics in Cybersecurity	1	-	-	1
CYS 893	C	Research Methodology	2	-	-	2
CYS 895	C	Advanced Cryptography	2	-	-	2
CYS 897	C	Information Security Management	2	-	-	2
		Total				**7**

M.Phil. SECOND SEMESTER COURSES

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
CYS 892	C	Cyber Security Engineering	2	-	-	2
CYS 894	C	Cyber Security Governance, Framework and Standard	2	-	-	2
		Elective I	2	-	-	2
		Elective II	2	-	-	2
		Total				**8**

Electives

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
CYS 812	E	Blockchain Security	2	-	-	2
CYS 814	E	Cybercrime and Forensics	2	-	-	2
CYS 816	E	Cyber Operations	2	-	-	2
CYS 818	E	Biometrics Security	2	-	-	2

M.Phil. THIRD SEMESTER

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
CYS 899	C	Master's Dissertation		-	36	6
		Total				**6**

CYS 891 Special Topics in Cybersecurity (1 Units)

A study of the current trends and popular recent research in cyber security will be the focus of this course.

CYS 892 Cyber Security Engineering (2 Units)

Cyber Security Engineering: Lifecycle Assurance of Systems and Software , Meaning of Lifecycle Assurance, Principles for Software Assurance,Risk Analysis Secure Software Development Management and Organizational Models ,The Management Dilemma, Assured Systems, Process Models for Software Development and Acquisition, CMMI Models in General, CMMI for Development (CMMI-DEV), CMMI for Acquisition (CMMI-ACQ), CMMI for Services (CMMI-SVC), CMMI Process Model Uses, Software Security Frameworks, Models, and Roadmaps, Building Security In Maturity Model (BSIMM), CMMI Assurance Process Reference Model, Open Web Application Security Project (OWASP) Software Assurance Maturity Model (SAMM), DHS SwA Measurement Work, Microsoft Security Development Lifecycle (SDL), SEI Framework for Building Assured Systems, SEI Research in Relation to the Microsoft SDL, CERT Resilience Management Model Resilient Technical Solution Engineering Process Area, International Process Research Consortium (IPRC) Roadmap, NIST Cyber Security Framework, Software Security Frameworks, Models, and Roadmaps, Engineering Competencies , Security Competency and the Software Engineering Profession, Software Assurance Competency Models, The DHS Competency Model, Organization of Competency Areas, SwA Competency Levels, Behavioral Indicators, National Initiative for Cybersecurity Education (NICE), The SEI Software Assurance Competency Model, Model Features, SwA Knowledge, Skills, and Effectiveness, Competency Designations, Examples of the Model in Practice, Highlights of the SEI Software Assurance

Competency Model, Performing Gap Analysis, Using the SEI's SwA Competency Model, Using the BSIMM, Metrics.

CYS 893 – Research Methodology
(2 Units)
Introduction to research methods (experimental design and analysis, modelling and simulation and the likes), including research paradigms and methodologies across cyber security, research question formulation, design of research approach, literature search and presentation of related work, analysis of results, verbal and written presentation skills, and research ethics. Students prepare and defend a thesis proposal or project proposal in an area of their choice.

CYS 894 Cyber Security Governance, Framework and Standard (2 Units)
Security Governance, Information Security Management, Using Security Standards., Security Governance Control Framework, Three-Level Control Framework, Strategic Level , Tactical Level, Operational Level, Main Functions of the Model Building Blocks, Strategy, Policies Organization, Risk Management., Program Management, Security Metrics, Reporting and Oversight, Asset Management, Compliance, Operational Level , Mapping between ISO 27001 and TLCF, Control Framework Use Cases, Model Use Cases, Governance Self-Assessment, Impact on Governance a Proactive Approach, Impact on Governance a Reactive Approach, Security Strategy, Security Strategy Content, Approach to Defining a Strategy, , Establish a Maturity Model of Security Services, Gap Analysis Using the Maturity Model, Consolidate Improvement Points into Initiatives, Initiatives to Improve Information Security Effectiveness, Grouping of Initiatives and Establishment of a Project Roadmap, Formulation of a Strategy, Security Strategy Communication, Policies, Internal Regulatory Framework Principles, Roles and Responsibilities in Information Security, Roles and Responsibilities of the Security Teams, Security Organizational Structures., Risk Management, Program Management., Security Metrics, Maturity Models, Security Index, Reporting and Oversight, Reporting for Governance, Components of a Security Reporting System, Asset Management, Compliance, Audit and Compliance Monitoring

CYS 895 Advanced Cryptography (2 Units)
Introduction to Cryptography, Symmetric, Substitution, Transposition, Major concepts and definitions, Keys, Asymmetric, Private and public key pair- deep dive, Algorithms – deep dive, Advantages and disadvantages of Symmetric, Authenticity, Non-Repudiation, Application of asymmetric, Key agreement and key exchange, Digital Signature, TLS Secure channel, Hashing Algorithms, Hash algorithms and concepts, Integrity, Birthday attack, Collisions, Application with PKI, HMAC, PKI, Certificate Authorities (CA), Certificate Management, Public Key Generation, Public Key Distribution, X509v3, Certificate classes, Registration Authorities, Certificate Policy Statement, CRL, OCSP, Certificate Pinning, Certificate Revocation, Trust Models, Certificate Life Cycle, Cryptography Standards and Agencies, NIST, NIST SP, NSA, Algebra and number theory, Rings of polynomials, Existence and finding primitive roots, Blum integers, Galois fields F_{p^k}, Primes; Agrawal, Kayal,
Saxena P-time algorithm for recognizing primes, Elliptic curves, Discrete logarithm based cryptosystems and signatures, Elliptic Curve Cryptosystem (ECC), Digital Signature Standard (DSS), Selection of other signature schemes, Discrete logarithm, Hashing, Steganography, Quantum computers, Shor's algorithm, future demise of RSA, Quantum cryptography, Quantum key distribution and reconciliation

CYS 897 Information Security Management (2 Units)
Information Security Principles, , Information Risk, Information Security Framework, Security Life Cycles, Procedural and People Security Controls, Technical Security Controls, Physical and Environmental Security, Disaster Recovery and Business Continuity Management, Investigations and Forensics , Role of Cryptography, Threat Intelligence, Cybersecurity Analytics and Machine Learning, Machine Learning and Models, Machine Learning and Natural Language Processing, Traffic Analysis, Game Theory and Predictive Models, Inductive Predictions, Deductive Predictions, Game Theory and Attack Modeling, Reasoning and Inference, Reasoning Systems, Ontology and Epistemology, Inference and The Ontological To Epistemic Transformation, Heuristics and Artificial Intelligence (AI) Decision Systems, Reasoning: Discrete versus Equivocal Problems, Synthetic Heuristics, Issues With Synthetic Heuristic Systems, Combining Techniques, Heuristic Biases and Security Planning, AI Decisions, Naive Theories and Biases, Interactions of Biases and Framing Effects, Biases, Framing Effects, And Security Decisions , Biologically Inspired Security And Adaptive Systems , Self-Healing Adaptive Systems, Damage and Danger, Trusted Security Kernels, Social

CYS 812 Blockchain Security (2 Units)
Introduction to Blockchain Security, The Goals of Blockchain Technology Structure of the Blockchain, Inside the Blockchain Ecosystem Threat Modelling for the Blockchain, Fundamentals Cryptographic Primitives Data Structures , Protocols, Consensus Block Creation, Infrastructure Nodes, Networks, Advanced Smart Contracts, Blockchain Extensions, Considerations for Secure Blockchain Design, Blockchain Type, Privacy and Security Enhancements, Legal and Regulatory Compliance Designing Secure Blockchains for the Future

CYS 814 Cybercrime and Forensics (2 Units)
Cyber Security and annual reports about cybercrimes, In the world, In Africa, IN Nigeria, Legal and institutional frameworks needed for cybersecurity and cybercriminality, Cybercrimes, Non-payment/non-delivery/advanced fee for goods and services, Personal data breach, Phishing / Vishing / Smishing / Pharming, Credit card fraud, Cyber extortion, Identity theft and government Impersonation, Cyber harassment, BEC (Business Email Compromise) and EAC (Email Account Compromise), Tech support fraud and misrepresentation, Malware dissemination (Virus, Worm, Scareware, Ransomware, Trojan, Backdoor, …), Large scale attack (Cyberterrosim, hacktivism,…), Denial of Service (DoS or DDoS), Cybervandalism, Software piracy and counterfeiting of programs, Data leak, Forensics Overview, Computer Forensics Fundamentals, Benefits of Computer Forensics, Computer Crimes, Computer Forensics Evidence and the Courts Cyber Forensics:, Computer forensics , Network forensics, Forensics tools, Forensics Process, Forensics Investigation Process, Securing the Evidence and Crime Scene, Chain of Custody, Law Enforcement Methodologies, Forensic Evidence , Evidence Sources, Evidence Duplication, Preservation, Handling, and Security, Forensics Soundness , Order of Volatility of Evidence, Collection of Evidence on a Live System, Court Admissibility of Volatile Evidence

CYS 816 Cyber Operations (2 units)
General Introduction, System Setup, Basic Offense, Operational Awareness, DNS and BIND, Scanning the Network, Active Directory , Attacking the Domain, Logging, Network Services, Malware and Persistence, Apache and ModSecurity, IIS and ModSecurity, Web Attacks, Firewalls, MySQL and MariaDB, Snort, PHP, Web Applications

CYS 818 Biometric Security (2 units)
Biometrics- Introduction- benefits of biometrics over traditional authentication systems -benefits of biometrics in identification systems-selecting a biometric for a system –Applications - Key biometric terms and processes biometric matching methods -Accuracy in biometric systems, Physiological Biometric, Fingerprints , Facial scan, Iris scan, Retina vascular pattern, Hand scan, Handprint Biometrics, DNA Biometrics, Signature and handwriting technology, Keyboard / keystroke dynamics, Voice, Multi biometrics and multi factor biometrics, Two-factor authentication with passwords, Tickets and tokens

CYS 899 Master's Dissertation (6 units)
An independent investigation of an appropriate computing research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organised and well-written form. The candidate is required to present at least two seminar papers before the final oral presentation. The thesis is examined in a viva voce.

CURRICULUM FOR MASTER OF PHILOSOPHY/DOCTOR OF PHILOSOPHY (M. PHIL/PHD) PROGRAMME IN CYBER SECURITY

1 . PROGRAMME OFFERED: Master of Philosophy/Doctor of Philosophy in Cyber Security

2. PROGRAMME PHILOSOPHY

The main goal of M.Phil/PhD. Cyber Security is to prepare professionally trained graduates for the universities, industries and government establishments. It has been designed to offer graduates the opportunity to develop a deeper

understanding of cyber security as a discipline. The focus within this programme on the principles, technologies and practices of cyber security helps graduates to gain the appropriate skills for future PhD studies and research careers as well as to become competent practitioners. The programme comprises particular developments in security with a firm base in academic research and also offers the opportunity for graduates to study selected topics in advanced Cyber Security.

3. PROGRAMME OBJECTIVES

The objectives of the program are to:

i) develop and provide academic and professional training in all areas of Cyber Security for the development of latent power of thinking in individuals;

ii) provide and promote sound practical and theoretical training in Cyber Security as foundation for research and technological development and for the purpose of job placement in Nigeria;

iii) provide students with adequate knowledge in Cyber Security to solve real-life problems in areas of Information Technology, Telecommunication, Finance, Defence, Government and other disciplines that require the knowledge of Cyber Security; and

iv) develop manpower that can identify the basic scientific and technological problems in area of Cyber Security and find appropriate solutions to them.

4. PROGRAMME JUSTIFICATION

The field of Cyber Security is dynamic and always experience new inventions in the face of new challenges in the field of Information Technology, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Moreover, the demand for Cybersecurity programme has risen in recent times due to these evolving discoveries. In view of the above considerations, the department of Cybersecurity is proposing the M. Phil. Cybersecurity programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

The requirements for admission into the M.Phil./PhD programme shall consist of:

(i) M.Tech. or M.Sc. in Information technology from FUTA or from other institutions with a CGPA of not less than 3.0 on a 5-point credit scale and a minimum score of 55%;

(ii) M.Tech. or M.Sc. in other related fields from other institutions with a CGPA of not less than 3.5 on a 5-point credit scale and a minimum score of 60% or as in (i) above for institutions similar to FUTA; and

(iii) All applications for the M.Phil./PhD programme shall be subjected to the School of Postgraduate Studies regulations.

6. Master of Philosophy/PhD in Cybersecurity

For students admitted through Master of Philosophy/PhD programme in Cyber Security
To be eligible for the award of the Ph.D degree in Cyber Security, a candidate must have:

(i) passed a total of 24 course units which include six units research and three units of research methodology and obtained a minimum CGPA of 3.0 and maximum of 3.49 from course work;

(ii) passed all the courses recommended by the Department with a minimum pass mark of 50% in each course;

(iii) successfully presented at least two seminars (proposal and progress seminars)

(iv) fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University; and

(v) successfully passed a conversion oral examination.

7. Requirement For Transfer To Ph.D. Programme

A student who enters the M.Phil. degree programme may be allowed to transfer to the Ph.D. programme if he/she makes a satisfactory progress in his/her study. Such a candidate will be expected to fulfil the following requirements:

(i) completed all course work with a CGPA of not less than 3.5;

(ii) successfully presented at least two seminars; proposal and progress seminars,

(iii) prepares and submits to the School of Postgraduate Studies through the Department, a research plan considered suitable for pursuing a Ph.D. degree;

(iv) presents a detailed report of research work done up to the time of seeking transfer and submit to the School of Postgraduate Studies any relevant

published and unpublished materials (if any) that can be assessed by the Department;

(v) passes an oral transfer examination to be conducted by the School of Postgraduate Studies with the panel of examiners drawn from his/her Department on the subject of the research and topics related to the field of study; and

(vi) fulfils all other conditions as prescribed by the Board of School of Postgraduate Studies of the University.

All the courses indicated in each of the tables given below are core and required for MPhil/PhD degree Cyber Security

Master of Philosophy/Doctor of Philosophy in Cyber Security

M.Phil./PhD FIRST SEMESTER COURSES

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
CYS 891	C	Special Topics in Computing	2	-	3	3
CYS 893	C	Research Methodology	2	-	3	3
		Elective	2	-	3	3
		Total				**9**
		Electives				
CYS 811	E	Software Security	2	-	3	3
CYS 813	E	IoT Security	2	-	3	3
CYS 815	E	Cyber Insurance	2	-	3	3
CYS 817	E	Enterprise Cyber Security	2	-	3	3

M.Phil./PhD, SECOND SEMESTER COURSES

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
CYS 892	C	Cyber Security Engineering	2	-	3	3
CYS 894	C	Cyber Security Governance, Framework and Standard	2	-	3	3
		Elective	2	-	3	3
		Total				**9**
		Electives				
CYS 812	E	Blockchain Security	2	-	3	3
CYS 814	E	Cybercrime and Forensics	2	-	3	3
CYS 816	E	Cyber Operations	2	-	3	3
CYS 818	E	Biometrics Security	2	-	3	3

M.Phil./PhD THIRD/FOURTH SEMESTERS

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
CYS 899	C	Individual Research Thesis		-	18	6
		Total				**6**

CYS 891 Special Topics in Cybersecurity (3 Units)

A study of the current trends and popular recent research in cyber security will be the focus of this course.

CYS 892 Cyber Security Engineering (3 Units)

Lifecycle Assurance of Systems and Software, Risk Analysis, Security Risk, Secure Software Development Management and Organizational Models, The Management Dilemma, Background on Assured Systems, Process Models for Software Development and Acquisition, CMMI Models in General, CMMI for Development (CMMI-DEV), CMMI for Acquisition (CMMI-ACQ), CMMI for Services (CMMI-SVC), CMMI Process Model Uses, Software Security Frameworks, Models, and Roadmaps, Building Security In Maturity

Model (BSIMM), CMMI Assurance Process Reference Model, Open Web Application Security Project (OWASP) Software Assurance Maturity Model (SAMM), DHS SwA Measurement Work, Microsoft Security Development Lifecycle (SDL), SEI Framework for Building Assured Systems, SEI Research in Relation to the Microsoft SDL, CERT Resilience Management Model Resilient Technical Solution Engineering Process Area, International Process Research Consortium (IPRC) Roadmap, NIST Cyber Security Framework, Software Assurance Competency Models, The DHS Competency Model, Organization of Competency Areas, SwA Competency Levels, Behavioral Indicators, National Initiative for Cybersecurity Education (NICE), The SEI Software Assurance Competency Model, Model Features, SwA Knowledge, Skills, Competency Designations, Performing Gap Analysis, Using the SEI's SwA Competency Model, Using the BSIMM, Metrics, Special Topics in Cyber Security Engineering.

CYS 893 – Research Methodology (3 Units)
Introduction to research methods (experimental design and analysis, modelling and simulation and the likes), including research paradigms and methodologies across cyber security, research question formulation, design of research approach, literature search and presentation of related work, analysis of results, verbal and written presentation skills, and research ethics. Students prepare and defend a thesis proposal or project proposal in an area of their choice.

CYS 894 Cyber Security Governance, Framework and Standard (3 Units)
Information Security Governance, Information Security Management, Using Security Standards, Security Governance Control Framework, Three-Level Control Framework, Strategic Level , Tactical Level, Operational Level, Main Functions of the Model Building Blocks, Strategy, Policies Organization, Risk Management., Program Management, Security Metrics, Reporting and Oversight, Asset Management, Compliance, Operational Level , Mapping between ISO 27001 and TLCF, Control Framework Use Cases, Governance Self-Assessment, Security Strategy, Security Strategy Content, Approach to Defining a Strategy, Initiatives to Support Business Operations., Maturity Model of Security Services, Gap Analysis Using the Maturity Model, Initiatives to Improve Information Security Effectiveness, Grouping of Initiatives and Establishment of a Project Roadmap, Formulation of a Strategy, Security Strategy Communication, Policies, Internal Regulatory Framework Principles, Classification of Regulatory Framework Documents, Roles and Responsibilities in Information Security, Roles and Responsibilities of the Security Teams, Security Organizational Structures., Risk Management, Program Management., Security Metrics, Maturity Models, Security Index, Importance of Reporting for Governance, Components of a Security Reporting System, Asset Management, Compliance, Audit and Compliance Monitoring

CYS 895 Advanced Cryptography (3 Units)
Introduction to Cryptography, Symmetric, Substitution, Transposition, Major concepts and definitions, Keys, Advantages and disadvantages of symmetric, Binary Math, Key Management, DES Operations, DES Modes, Asymmetric, Private and public key pair- deep dive, Algorithms – deep dive, Advantages and disadvantages of Symmetric, Authenticity, Non-Repudiation, Application of asymmetric, Key agreement and key exchange, Digital Signature, TLS Secure channel, Hashing Algorithms, Hash algorithms and concepts, Integrity, Birthday attack, Collisions, Application with PKI, HMAC, PKI, Certificate Authorities (CA), Certificate Management, Public Key Generation, Public Key Distribution, X509v3, Certificate classes, Registration Authorities, Certificate Policy Statement, CRL, OCSP, Certificate Pinning, Certificate Revocation, Trust Models, Certificate Life Cycle, Cryptography Standards and Agencies, NIST, NIST SP, NSA, Algebra and number theory, Rings of polynomials, Existence and finding primitive roots, Blum integers, Galois fields F_{p^k}, Primes; Agrawal, Kayal,
Saxena P-time algorithm for recognizing primes, Elliptic curves, Discrete logarithm based cryptosystems and signatures, Elliptic Curve Cryptosystem (ECC), Digital Signature Standard (DSS), Selection of other signature schemes, Discrete logarithm, Hashing, Steganography, Quantum computers, Shor's algorithm, future demise of RSA, Quantum cryptography, Quantum key distribution and reconciliation

CYS 897 Information Security Management (3 Units)
Information Security Principles, , Information Risk, Information Security Framework, Security Life Cycles, Procedural and People Security Controls, Technical Security Controls, Physical and Environmental Security, Disaster Recovery and Business Continuity Management, Investigations and Forensics , Role of Cryptography, Threat Intelligence, Cybersecurity Analytics and Machine Learning, Machine Learning and Models, Machine Learning and Natural Language Processing, Traffic Analysis, Game Theory and Predictive Models, Inductive Predictions, Deductive

Reasoning and Inference, Reasoning Systems, Ontology and Epistemology, Inference and The Ontological To Epistemic Transformation, Heuristics and Artificial Intelligence (AI) Decision Systems, Reasoning: Discrete versus Equivocal Problems, Synthetic Heuristics, Issues With Synthetic Heuristic Systems, Combining Techniques, Heuristic Biases and Security Planning, AI Decisions, Naive Theories and Biases, Interactions of Biases and Framing Effects, Biases, Framing Effects, And Security Decisions , Biologically Inspired Security And Adaptive Systems , Self-Healing Adaptive Systems, Damage and Danger, Trusted Security Kernels, Social Systems, Sociobiologically Inspired Systems.

CYS 811 Software Security (3 Units)
Introduction, Significance of Security in Software, Software Assurance and Software Security, Threats to Software Security, Sources of Software Insecurity, The Benefits of Detecting Software Security Defects Early, Managing Secure Software Development, What Makes Software Secure, Defining Properties of Secure Software, Requirements Engineering for Secure Software, Misuse and Abuse Cases, The SQUARE Process Model, SQUARE Sample Outputs Section, Requirements Elicitation, Requirements Prioritization, Secure Software Architecture and Design, Software Security Practices for Architecture and Design: Architectural Risk Analysis, Software Security Knowledge for Architecture and Design: Security Principles, Security Guidelines, and Attack Patterns, Considerations for Secure Coding and Testing, Code Analysis, Coding Practices, Software Security Testing, Security Testing Considerations Throughout the SDLC , Security and Complexity: System Assembly Challenges , Security Failures, Functional and Attacker Perspectives for Security Analysis, System Complexity Drivers and Security, Deep Technical Problem Complexity , Governance, and Managing for More Secure Software , Governance and Security, Adopting an Enterprise Software Security Framework, Security Project Management, Maturity of Practice.

CYS 812 Blockchain Security (3 Units)
Introduction to Blockchain Security, The Goals of Blockchain Technology Structure of the Blockchain, Inside the Blockchain Ecosystem Threat Modelling for the Blockchain, Fundamentals Cryptographic Primitives Data Structures , Protocols, Consensus Block Creation, Infrastructure Nodes, Networks, Advanced Smart Contracts, Blockchain Extensions, Considerations for Secure Blockchain Design, Blockchain Type, Privacy and Security Enhancements, Legal and Regulatory Compliance Designing Secure Blockchains for the Future

CYS 813 IoT Security (3 Units)
IoT Overview, IoT Security, Attacks and Countermeasures, Authentication and Authorization, Other Security Features and Related Issues , IoT Network and Communication Authentication, Symmetric Key-Based Authentication with an Application to Wireless Sensor Networks, System Model and Assumptions, Scheme in Normal Mode, Authentication, Scheme in Change Mode, Security Analysis, Efficiency, Public Key Based Protocols – EC Crypto, Introduction to ECC, ECC Based Implicit Certificates, ECC-Based Signcryption, ECC-Based Group Communication, Implementation , Lattice-Based Cryptography and Internet of Things , Lattice-Based Cryptography, Lattice-Based Cryptography for IoT, IoT User Level Authentication, Network Model and Adversary Model , Security and Performance Evaluation, Biometric-Based Robust Access Control Model for Industrial Internet of Things Applications , Network Model, Threat Model and Security Requirements, Proposed Access Control Model in IoT, Security and Performance Evaluations, Gadget Free Authentication, IoT-Related Concerns, IoT Device Level Authentication, PUF-Based Authentication and Key Exchange for Internet of Things, Hardware-Based Encryption via Generalized Synchronization of Complex Networks, Remote Patient Monitoring Security , Secure and Efficient Privacy-preserving Scheme in Connected Smart Grid Networks, Blockchain-Based Cyber Physical Trust Systems.

CYS 814 Cybercrime and Forensics (3 Units)
Cyber Security and annual reports about cybercrimes, In the world, In Africa, In Nigeria, Legal and institutional frameworks needed for cybersecurity and cybercriminality, Cybercrimes, Non-payment/non-delivery/advanced fee for goods and services, Personal data breach, Phishing / Vishing / Smishing / Pharming, Credit card fraud, Cyber extortion, Identity theft and government Impersonation, Cyber harassment, BEC (Business Email Compromise) and EAC (Email Account Compromise), Tech support fraud and misrepresentation, Malware dissemination Large scale attack, Denial of Service (DoS or DDoS), Cybervandalism, Software piracy and counterfeiting of programs, Data leak, Forensics Overview, Computer Forensics Fundamentals, Benefits of Computer Forensics, Computer Crimes, Computer Forensics Evidence and the Courts Cyber Forensics:, Computer forensics , Network forensics, Forensics tools,

Forensics Process, Forensics Investigation Process, Securing the Evidence and Crime Scene, Chain of Custody, Law Enforcement Methodologies, Forensic Evidence , Evidence Sources, Evidence Duplication, Preservation, Handling, and Security, Forensics Soundness , Order of Volatility of Evidence, Collection of Evidence on a Live System, Court Admissibility of Volatile Evidence

CYS 815 Cyber Insurance (3 units)
A Market-Driven Approach To Cybersecurity , History of Cyber insurance, Breach on the Beach: Origins of Cyber insurance, Cybersecurity Claims Under Non-Cyber Coverage, Privacy versus Network Security Breach, Private Information, Meaning of Cyber Insurance, Meaning of Privacy Liability, Privacy in businesses, Network Security Liability, First Party vs Third Party Coverage – Introduction, Main Insuring Clauses in a Cyber Policy: Third Party Coverages, Main Insuring Clauses in a Cyber Policy: First Party Coverages, Insuring Clauses Activists, Computing Definitions, claims Example: First Party & Third Party Illustrated, Exposures & Coverage, Privacy Breaches Exposure & Coverage, Privacy Breach Coverage, Privacy Breach, Network Security Vulnerabilities – Exposures, Network Security Vulnerabilities – Coverage, Ransomware – Coverage, Exposure & Coverage: Business Interruption, Business Interruption in a Cyber policy, Contingent BI, Waiting Hours and Restoration Period, Business Interruption, Exposure & Coverage: Media Liability, Media Liability Introduction & Definitions, Media Liability – Software Copyright & Social Media, Social Engineering Fraud, Social Engineering Fraud Coverage

CYS 816 Cyber Operations (3 units)
General Introduction, System Setup, Basic Offense, Operational Awareness, DNS and BIND, Scanning the Network, Active Directory , Attacking the Domain, Logging, Network Services, Malware and Persistence, Apache and ModSecurity, IIS and ModSecurity, Web Attacks, Firewalls, MySQL and MariaDB, Snort, PHP, Web Applications

CYS 817 Enterprise Cyber Security (3 units)
The Cybersecurity Challenge, Defining the Cybersecurity Challenge, Meeting the Cybersecurity Challenge, A New Enterprise Cybersecurity Architecture, Cybersecurity , Implementing Enterprise Cybersecurity, Operating Enterprise, Enterprise Cybersecurity and the Cloud, Enterprise Cybersecurity for Mobile and BYOD, The Art of Cyberdefense, Building an Effective Defense , Responding to Incidents , Managing a Cybersecurity Crisis, Enterprise Cyberdefense Assessment, Assessing Enterprise Cybersecurity, Measuring a Cybersecurity Program, Mapping Against Cybersecurity, Enterprise Cybersecurity Program, Managing an Enterprise Cybersecurity Program.

CYS 818 Biometric Security (3 units)
Biometrics- Introduction- benefits of biometrics over traditional authentication systems -benefits of biometrics in identification systems-selecting a biometric for a system –Applications - Key biometric terms and processes biometric matching methods -Accuracy in biometric systems, Physiological Biometric, Fingerprints , Facial scan, Iris scan, Retina vascular pattern, Hand scan, Handprint Biometrics, DNA Biometrics, Signature and handwriting technology, Keyboard / keystroke dynamics, Voice, Multi biometrics and multi factor biometrics, Two-factor authentication with passwords, Tickets and tokens.

CYS 899 Master's Dissertation (12 units)
An independent investigation of an appropriate computing research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organised and well-written form. The candidate is expected to present a proposal seminar before the conversion seminar.

CURRICULUM FOR DOCTOR OF PHILOSOPHY (Ph.D) PROGRAMME IN CYBER SECURITY

1. PROGRAMME OFFERED: Doctor of Philosophy (Ph. D.) in Cyber Security

2. AVAILABLE OPTIONS/SPECIALIZATIONS

i) Cyber Security Engineering
ii) Cyber Security Governance, Framework and Standards
iii) Cyber Security Operations
iv) Cyber Threat Intelligence
v) Cyber Security Risk Management

3. PROGRAMME PHILOSOPHY

The programme is designed to equip students with adequate knowledge and skills in Cyber Security with focus on advanced theoretical and practical training to ensure the attainment of desired intellectual development and competence in solving real life problems.

4. PROGRAMME OBJECTIVES

The objectives of the programme are to:

i.) develop and give advanced academic and professional training (practical and theoretical) in all areas of Cyber Security for the purpose of job placement in the industries and to be self-employed and create jobs;
ii.) expose the students to current research and up-to-date methodologies in Cyber Security, and increase their understanding of the applications of Cyber Security methodology to solving real-life security problems, protection of critical infrastructure and national assets as well as other disciplines that require the knowledge of Cyber Security; and
iii.) develop manpower that is research-oriented in the area of Cyber Security for the sustenance of teaching and research in both public and private institutions of higher learning and non-governmental organizations.

5. PROGRAMME JUSTIFICATION

The dynamic nature of statistical training makes it crucial to conduct periodic review of its curriculum. The field of Cyber Security has continued to witness increasing expansion as new areas and new techniques are developed. Hence, the courses have to be in tune with the latest developments in the subject and also take cognizance of the newer methods of statistical analysis which are now totally computerized. In addition, demand for products of the programme has risen in recent times because of the increase in the number of private and public tertiary institutions offering Cyber Security in the country. The graduates of the programme provide the requisite manpower for these institutions. Thus, it has become inevitable to make the programme respond to the needs of both academic researchers and practicing statisticians in training institutions and industries.

6. ADMISSION REQUIREMENTS

Candidates seeking admission into the Ph.D. programme are required to possess:

i) M. Tech degree in Cyber Security or related discipline of FUTA or any other recognized University with a minimum CGPA of 3.5 on 5-point credit scale or have a minimum overall score of 60%
ii) M. Phil degree in Cyber Security of FUTA or any other recognized University with a minimum CGPA of 3.5 on 5-point credit scale or have a minimum overall score of 60%

7. PROGRAMME DURATION

The Ph.D. programme shall run for a minimum of 36 months and a maximum of 48 months of intensive research for full time and a minimum of 48 months and a maximum of 60 months for part-time students.

8. GRADUATION REQUIREMENTS

To be eligible for the award of Ph.D. in Cyber Security, a candidate must have carried out an independent research work in his/her specialization under the general supervision of selected senior academic staff in the chosen field of research. The candidate must demonstrate high scholastic ability through the research. The thesis emanating from the research should exhibit originality and the result must form distinct contributions to knowledge. In carrying out this main requirement,

i) A candidate must, in consultation with his/her supervisors, present a comprehensive research proposal seminar at the department successfully within the first year of study
ii) As in 8(i), a candidate must present progress seminars in the department successfully
iii) On completion of the research, the candidate must present an end-of-thesis seminar successfully in

the department

iv) fulfilled all other conditions as approved by the School of Postgraduate Studies and the University

v) A candidate after carrying out satisfactorily post seminar review, must submit the required number of copies of thesis for a viva; and pass satisfactorily the oral examination of the submitted thesis before a panel of examiners.

vi) CYS 899 PhD Thesis:

An independent investigation of an appropriate computing research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organised and well-written form. The candidate is required to present at least three seminar papers before the final oral presentation. The thesis is examined in a viva voce.

LIST OF ACADEMIC STAFF

S/N	NAME	QUALIFICATIONS	STATUS	AREA OF SPECIALIZATION
1	Dr. O. D. Alowolodu	B.Sc., (Ado), M.Tech., Ph.D. (Akure)	Reader /HOD	Cloud Computing, Computer Network Security
2	Prof. B. K. Alese	B.Tech., M.Tech., Ph.D. (Akure)	Professor	Cryptography and Information Security Management
3	Dr. A. J. Gabriel	B.Sc., (Sokoto), M.Tech., Ph.D. (Akure)	Reader	Cryptography and Information Security Management
4	Dr. O. Owolafe	B.Sc., (Ebonyi), M.Tech., Ph.D. (Akure)	Reader	Information Security, Intrusion Detection
5	Dr. O. A. Odeniyi	B.Sc., (Ado), M.Tech., Ph.D. (Akure)	Senior Lecturer	Image Processing, Information Security
6	Dr. O. A. Ayeni	B.Sc. Ed, (Ife), PGD, M.Tech., Ph.D. (Akure)	Senior Lecturer	Intrusion Detection, Image Processing, Computer Vision, Information Security
7	Dr. O. K. Akinyokun	B.Sc., (Lisa Remo), M.Tech., PhD (Akure)	Lecturer I	Digital Forensics, Information Security
8	Mr A. Oronti	B.Sc., (Ago Iwoye), M.Tech. (Akure)	Asst Lacturer	Network Security
9	Mr. O. O. Abereowo	B.Sc., (Lisa Remo), M.Tech. (Akure)	Asst Lecturer	Network Security

9.3.3 DEPARTMENT OF INFORMATION SYSTEMS

CURRICULUM FOR POSTGRADUATE DIPLOMA (PGD) PROGRAMME IN INFORMATION SYSTEMS

1. PROGRAMME OFFERED: Postgraduate Diploma (PGD) in Information Systems

2. PROGRAMME PHILOSOPHY

The Postgraduate Diploma in Information Systems is designed to equip prospective students with the essential computing skills desirable for the effective performance of personnel in the universities, public and private institutions, industries and government establishments. It will allow for the development of human resources and computer systems particularly relevant to the nation's needs.

3. PROGRAMME OBJECTIVES

The objectives of the Postgraduate Diploma degree programme in Information Systems are to:

i. identify technologies and trends related to Information Systems that have strategic value for an organisation and manage the implementation of those technologies;
ii. understand, design and implement security solutions related to database systems;
iii. design web and mobile applications;
iv. identify the basic tenets of computer network and communication technology;
v. define secure enterprise information system solutions utilising cloud technologies;
vi. implement responsive business enterprise system solutions on multiple computer platforms; and
vii. manage Information and communication solutions for a variety of business and industry applications.

4. PROGRAMME JUSTIFICATION

The field of Information Systems (IS) is dynamic and always experience new inventions, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Also, the demand for IS programmes has risen in recent times due to these evolving discoveries. In view of the above considerations, the Department of Information Systems is proposing the PGD Information Systems programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

Holder of HND from recognized Polytechnics and other equivalent Institutions with at least Lower Credit or minimum of a third-class Bachelor's Degree from recognised University.

6. PROGRAMME DURATION

The programme is expected to run on a full-time basis for a minimum of four (4) semesters and a maximum of five (5) semesters.

7. GRADUATION REQUIREMENTS

To be eligible for the award of the PGD in Information Systems, a candidate must have:

i. passed all core courses and successfully completed the project work; and
ii. passed a minimum of 60 credit units.

8. COURSE OUTLINE

FIRST YEAR FIRST SEMESTER

Course Code	Status	Course Title	Contact Hours			Units
			L	T	P	
IFS 701	C	Introduction to Information Systems	2	0	0	2
IFS 703	C	Knowledge Management and Information Retrieval	2	0	3	3
IFS 705	C	Business Information Systems	2	0	0	2
IFS 707	C	Information Systems Analysis and Design	2	0	3	3
IFS 709	C	Business Process Management	2	0	0	2
IFS 711	C	Data Analysis	2	0	3	3
Total						**15**

FIRST YEAR SECOND SEMESTER

Course Code	Status	Course Title	Contact Hours			Unit(s)
			L	T	P	
IFS 702	C	Information Systems Security	2	1	0	3
IFS 704	C	eCommerce Technologies	2	0	3	3
IFS 706	C	Database Systems	2	0	3	3
IFS 708	C	Systems Conceptual Design	2	1	0	3
IFS 710	C	Business Process Reengineering	2	1	0	3
Total						**15**

SECOND YEAR FIRST SEMESTER

Course Code	Status	Course Title	Contact Hours			Unit(s)
			L	T	P	
IFS 713	C	Statistical Computing	2	0	3	3
IFS 715	C	Systems Engineering	2	1	0	3
IFS 717	C	Artificial Intelligence in Information Systems	2	1	0	3
IFS 719	C	Information Systems Audit and Controls	2	1	0	3
IFS 721	C	Information System Innovation and New Technology	2	1	0	3
Total						**15**

SECOND YEAR SECOND SEMESTER

Course Code	Status	Course Title	Contact Hours			Unit(s)
			L	T	P	
IFS 712	C	Mobile Application Development	2	0	3	3
IFS 714	C	Information Systems Strategy and Management	2	0	3	3
IFS 716	C	Artificial Intelligence Marketing	2	0	3	3
IFS 799	C	PGD Research Project	0	0	18	6
Total						**15**

9. COURSE SYNOPSES

IFS 701 Introduction to Information Systems (2 Units)

The course provides a comprehensive overview of the role and importance of information systems in modern organizations. Students will explore various types of information systems, including transaction processing systems, management information systems, and decision support systems. The course covers fundamental concepts such as the components of information systems, their applications in business processes, and the impact of these systems on organizational efficiency and decision-making. Through a combination of theoretical knowledge and practical case studies, students will gain an understanding of how information systems support business operations, enhance strategic planning, and drive innovation in various industries.

IFS 702 Information Systems Security (3 Units)

Introduction to information security; Inspection: Resource inventory, Threat assessment, Identifying vulnerabilities, and Assigning safeguards; Protection: Awareness, Access, Identification, Authentication, Authorisation, Availability, Accuracy, Confidentiality, Accountability, and Administration; Detection: Intruder types, Intrusion methods, Intrusion process, Detection methods, and Monitoring systems; Reaction: Incident determination, Incident notification, Incident containment, Assessing damage, Incident recovery, and Automated response; Reflection: Incident documentation, Incident evaluation, and Legal prosecution; Risk assessment frameworks; Security engineering: Protocols, Passwords, Access controls, and Cryptography; Physical aspects: Biometrics, Physical tamper resistance, and Security printing and seals; Security in connected systems and networks:

Distributed systems, Telecom system security, Network attack and defence, and Protecting e-commerce systems; Policy and management issues: Copyright and privacy protection, and E-policy

IFS 703 Knowledge Management and Information Retrieval (3 Units)

Issues with Knowledge Representation and Knowledge Engineering; ETL process (Extract, Transform, Load); data quality mining; data cleansing; data mining; Web mining; text mining; Special purpose database systems: deductive databases; active databases; Digital Libraries; Information Retrieval (IR) – systems, theory and technologies: Boolean search; textual conflation e.g. stemming and stopword removal; probabilistic IR model; Vector Space IR model; relevance feedback; text categorisation and information filtering; information extraction; question answering and related topics in NLP and computational linguistics; IR systems and search engines, for example, Google's PageRank, IBM's Web Fountain; evaluation; Search Engine Optimisation.

IFS 704 eCommerce Technologies 3 Units)

The eCommerce Technology course provides a comprehensive examination of the technological infrastructure, strategies, and tools essential for building and managing successful eCommerce platforms. Students will explore key topics including online storefront development, payment gateways, inventory management systems, order fulfillment processes, and customer relationship management (CRM) systems. Through a combination of theoretical insights and hands-on practical exercises, participants will gain proficiency in selecting and configuring eCommerce platforms, optimizing website performance, and implementing digital marketing and analytics strategies to drive traffic and conversions. Emphasizing industry best practices and emerging trends, the course will also cover topics such as mobile commerce, omnichannel retailing, and security considerations in eCommerce transactions. By the end of the course, students will possess the skills and knowledge necessary to design, deploy, and optimize eCommerce solutions that meet the evolving needs of businesses and consumers in the digital marketplace.

IFS 705 Business Information Systems (2 Units)

Information systems and competitive advantage, including the value chain, and the nature of data, information and knowledge; Business systems concepts, business processes and business systems; Communication, networks, software, models for effective virtual communication; Interacting, including the basics of interface design, and workplace ergonomics; Impact of technology on working life, and new modules of working; Developing and changing technology, including stages in systems development projects, such as analysis, specification, design and implementation; E-business and e-commerce; Learning with information systems, including innovation, decision making and knowledge management; Control and security, in networked environments, including intranet and internet.

IFS 706 Database Systems (3 Units)

Database concepts: file systems and databases, relational database model; design concepts and implementation: entity relationship modelling; normalisation of database tables, structured query language; database design and implementation; introduction to transaction management and concurrency control, distributed database management systems; database privacy, security, failure and recovery. Data and database administration; Transaction processing; Using a database management system from an application development environment; Use of database management systems in an enterprise system context; Data/information architecture; Data security management; Data quality management: Data quality principles, Data quality audits, and Data quality improvement; Business intelligence: Online analytic processing, Data warehousing, Data mining, and Enterprise search.

IFS 707 Information Systems Analysis and Design (3 Units)

Identification of opportunities for IT-enabled organisational change; Business process management; Analysis of business requirements: Business process modelling, and Information requirements; Structuring of IT-based opportunities into projects; Project specification; Project prioritisation; Analysis of project feasibility; Fundamentals of IS project management in the global context; Using globally distributed communication and collaboration platforms; Analysis and specification of system requirements; Different approaches to implementing information systems to support business requirements: Packaged systems, enterprise systems, outsourced development, and in-house development; Methods for comparing systems implementation approaches; Organisational implementation of a new information system; Different approaches to systems analysis and design: structured SDLC, unified process/UML, agile methods

IFS 708 Systems Conceptual Design (3 Units)

The course focuses on the early stages of systems development, emphasizing the creation of a high-level blueprint that outlines system requirements and architecture. Students will learn to conduct thorough needs assessments, develop conceptual models, and create detailed specifications that guide the subsequent stages of system development. The course covers methodologies such as use case analysis, process modeling, and data flow diagrams, as well as techniques for stakeholder engagement and requirement validation. Through practical exercises and project-based learning, students will acquire the skills necessary to design effective, user-centered systems that meet organizational goals and user needs.

IFS 709 Business Process Management (2 Units)

Challenges in managing business processes, and approaches to business process management and improvement; Understanding organisational processes: Business process definition and classification, Identifying core processes, Modelling processes, and Documenting processes; Process assessment: Measuring performance, Benchmarking, and Statistical techniques for process measurement; Process improvement: Process design guidelines and principles, Continuous process improvement, and Change management; Using IT for process management and improvement: Business process improvement and modelling software, Tools of business process simulation, ERP systems, and Use cases; Organisational issues in business process management: Understanding the customer, Business process outsourcing, and Managing processes that cross organisational borders.

IFS 710 Business Process Reengineering (3 Units)

Introduction to company structures; Introduction to business process reengineering; Workflow redesign and implementation; Reengineering success or failure; Management Systems; Health and Safety Management Systems; Quality Management Systems in Software; Information Security Management Systems; Quality Management Principles; Auditing, Media for Documentation; Integrated Management Systems; Introduction to EFQM; Comparison of TQM and business process reengineering; Brief introduction to Lean and Six Sigma Methodologies.

IFS 711 Data Analysis (3 Units)

This course offers a comprehensive introduction to the principles and techniques essential for collecting, processing, and analyzing data to extract meaningful insights and support decision-making. Covering topics such as data cleaning, exploratory data analysis, statistical inference, and data visualization, the course provides hands-on experience with tools like Python, R, and various visualization libraries. Emphasizing both theoretical foundations and practical applications, students will work on projects and case studies across diverse fields, developing skills to independently perform comprehensive data analyses and effectively communicate their findings. Suitable for all levels, this course equips learners with the proficiency needed for data-driven decision making.

IFS 712 Mobile Application Development (3 Units)

The "Mobile Application Development" course offers a thorough introduction to the principles and practices involved in creating applications for mobile devices. Students will learn about mobile operating systems, development environments, and the unique challenges of mobile interface design. The course covers essential programming languages and frameworks, such as Java for Android and Swift for iOS, along with topics like user experience design, responsive layouts, and performance optimization. Through hands-on projects and real-world case studies, students will gain practical experience in building, testing, and deploying mobile applications, equipping them with the skills needed to develop innovative and effective mobile solutions for various platforms.

IFS 713 Statistical Computing (3 Units)

The course provides an in-depth exploration of computational techniques essential for modern statistical analysis. Students will learn to leverage software tools and programming languages such as R and Python to perform data manipulation, statistical modeling, and simulation. The curriculum covers algorithms for statistical computation, optimization methods, and the implementation of various statistical techniques. Emphasizing practical applications, students will engage in hands-on projects and case studies, developing the ability to handle large datasets and perform complex analyses. By the end of the course, students will be equipped with the computational skills necessary to conduct robust statistical analyses and contribute effectively to data-driven research and decision-making

IFS 714 Information Systems Strategy and Management (3 Units)

The course delves into the strategic role of information systems within organizations and how they can be leveraged to achieve business objectives. Students will learn about the alignment of information systems with business goals, the development of IS strategies, and the management practices necessary for effective IS governance. The course covers topics such as strategic planning, competitive advantage through IS, IS investment evaluation, and risk management. By examining real-world case studies and engaging in practical projects, students will acquire the skills to manage, and lead IS initiatives that drive organizational success and innovation.

IFS 715 Systems Engineering (3 Units)

The course offers a comprehensive exploration of the principles and methodologies essential for designing and managing complex systems throughout their lifecycle. Students will delve into systems thinking, learning to analyze and understand the interactions between system components and stakeholders. Through a combination of theoretical study and practical applications, students will master the processes of requirements analysis, system design, integration, and testing. The course covers various tools and techniques used in systems engineering, including modeling and simulation, risk management, and configuration management. Emphasizing interdisciplinary collaboration and problem-solving, students will develop the skills necessary to tackle real-world challenges and deliver innovative, reliable, and sustainable systems across diverse industries.

IFS 716 Artificial Intelligence Marketing (3 Units)

The course provides a comprehensive exploration of how artificial intelligence (AI) is revolutionizing the field of marketing. Students will delve into the applications of AI techniques such as machine learning, natural language processing, and predictive analytics in various aspects of marketing strategy and execution. Through a combination of theoretical study and hands-on projects, students will learn to leverage AI-powered tools and platforms for customer segmentation, personalized messaging, content optimization, and marketing campaign automation. The course will also cover ethical considerations and challenges associated with AI adoption in marketing practices. By the end of the course, students will possess the skills and knowledge necessary to harness the power of AI to drive marketing effectiveness, enhance customer experiences, and achieve business objectives in the digital age.

IFS 717 Artificial Intelligence in Information Systems (3 Units)

The course introduces students to the concepts and applications of artificial intelligence (AI) within the realm of information systems. It covers AI techniques such as machine learning, natural language processing, and expert systems, and explores how these technologies can be integrated into information systems to enhance business processes and decision-making. Students will learn about the practical implementation of AI tools to solve complex organizational problems, improve efficiency, and drive innovation. Through hands-on projects and case studies, the course provides a deep understanding of the transformative potential of AI in various industries and prepares students to leverage AI technologies to create intelligent and adaptive information systems.

IFS 719 – Information Systems Audit and Controls (3 Units)

The need for information technology audit and controls; Information technology risks – Business Process and Business Continuity: Protection of information assets, Business process evaluation and risk management, Systems development and maintenance activities, and Disaster recovery and business continuity; Auditing ethics, guidelines, and standards of the profession: Generally Accepted Auditing Standards, Control Objectives for Information and related Technology, ISACA, and Val IT; Undertaking an information system audit: Internal audit and external audit; Controls over information and processes: Physical and environmental controls, Network controls, System software controls, Database controls, Application controls, Internet and e-commerce controls, Installation and operational controls, Change controls, Access controls, Encryption, authentication and non-repudiation, End-user controls, Software licensing controls, and Governance; Controls Assessment: Separation of duties, Delegation of authority and responsibility, System of authorisations, Documentation and records, Physical control over assets and records, Management supervision, Independent checks, and Recruitment and training.

IFS 721 Information System Innovation and New Technologies (3 Units)

Globalisation; Conversation about the commoditisation of IT; Technologies that have shaped the electronic world;

Process of IS innovation: Diffusion, and Innovation cycles; Strategic importance of the Web as a platform: Web services, Collective intelligence, Peer-to-peer networking, and Social networking; Web 2.0 tools: RSS, Podcasts, Wikis, Blogs, and Mash-ups; Information organisation: Categorisation, Taxonomies, and Tagging; Virtual teams; Economics of digital goods and services: E-commerce distribution - The Long Tail, Wikinomics, and The Free Economy; Search space: How search works, How search is monetised, and Strategic importance of search; Knowledge management; Future trends

IFS 799 PGD Research Project (6 Units)

An independent or group investigation of appropriate software, hardware, communication and networks or IT related problems in information systems carried out under the supervision of a lecturer. Project topics are usually in the following areas: databases, data analysis, artificial intelligence, computer graphics, gaming, virtual environments, computer vision, visualisation, pattern recognition, e-technology, communication systems, real-time systems, distributed networks, robotics. Before registering, the student must submit a written proposal to the supervisor to review. The proposal should give a brief outline of the project, estimated schedule of completion, and computer resources needed. A formal written report is essential and an oral presentation may also be required.

A formal written report, chapters 4 - 5 has to be approved by the supervisor. A final report comprising chapters 1 - 5 will be submitted to the department for final grading. An oral presentation is required.

CURRICULUM FOR MASTER OF TECHNOLOGY M.Tech. PROGRAMME IN INFORMATION SYSTEMS

1. PROGRAMME OFFERED: Master of Technology M.Tech. in Information Systems

2. AVAILABLE OPTIONS/SPECIALIZATIONS

i. Management of Business Information Systems
ii. Business Analytics
iii. Intelligent Information Systems and Artificial Intelligence
iv. Health Informatics

3. PROGRAMME PHILOSOPHY

The last twenty years or so has seen a dramatic growth in the demand for professionals trained in information systems. This growth was partly driven by tremendous technological advances, such as the emergence of computer networking, including wireless networking, graphical user interfaces, and the Internet, the world–wide–web, and their applications. But the growth in demand was also driven by a much greater realisation on the part of many organisations and individuals of the importance of information technologies for their well–being, and the more widespread use of these technologies by individuals whose primary area of expertise was not in information technology. While programme in traditional computing disciplines such as computer engineering and computer science responded to these new trends, albeit often slowly, employers started to demand skills that graduates typically did not get out of a traditional computer science or computer engineering programme. In the present age, there is a need for programme that will equip graduates with the practical network or system administration skills that organisations needed to expand and maintain their information technology infrastructures, or the web development skills required to take advantage of the many opportunities opened up by the Internet.

The M.Tech. in Information systems programme will provide sufficient understanding of organisational processes to be able to support Information systems applications from a user or organisational perspective. The programme is designed to provide students with necessary tools for computing and information systems techniques and logical reasoning. The curriculum emphasises the art, science, engineering and technology of computing and information systems. The students are trained to solve the challenges as professional information analyst in private and public organisation, industries, higher institutions of learning, government corporations and so on. The programme will produce professionals that are equipped to develop intelligent local content system solutions to solve the immediate problems in our environment.

4. PROGRAMME OBJECTIVES

The objectives of the Master degree programme in Information Systems are to:

i. identify technologies and trends related to Information Systems that have strategic value for an organisation and manage the implementation of those technologies;
ii. understand, design and implement security solutions related to database systems;
iii. design web and mobile applications;
iv. identify the basic tenets of computer network and communication technology;
v. define secure enterprise information system solutions utilising cloud technologies;
vi. implement responsive business enterprise system solutions on multiple computer platforms; and
vii. manage Information and communication solutions for a variety of business and industry applications.

5. PROGRAMME JUSTIFICATION

The field of Information Systems (IS) is dynamic and always experience new inventions, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Also, the demand for IS programmes has risen in recent times due to these evolving discoveries. In view of the above considerations, the Department of Information Systems is proposing the Master in Information Systems programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

6. ADMISSION REQUIREMENTS

To be eligible for admission, candidates must possess any one of the following:

i. B. Tech degree in Information Systems or any other relevant course from School of Computing, FUTA or from any other recognized University with a minimum of Second -Class Lower Division;
ii. Bachelor's Degree in related disciplines from FUTA or any other recognized University with a minimum of Second-Class Lower Division and sufficient background in Computing may be considered; and
iii. HND in related discipline with a minimum of Lower Credit plus a PGD in any relevant course from School of Computing, FUTA or any other recognized institutions with a minimum of upper credit (CGPA of 3.5/5.0).

7. PROGRAMME DURATION

The M. Tech. in Information Systems programme is expected to last for a minimum of 18 months and a maximum of 24 months

8. GRADUATION REQUIREMENTS

To be eligible for the award of M. Tech. Degree in Information Systems, a candidate must have:

a. passed all core courses and successfully completed the project work;
b. passed a minimum of 42 credit units, made up as follows:
   i. 30 credit units in core courses;
   ii. 12 credit units in research thesis; and
c. fulfill other requirements from Post Graduate School.

In addition, the candidate after carrying out satisfactorily a supervised project in any chosen specialization area of Information systems must submit the required number of copies of dissertation; and pass satisfactorily an oral examination on the dissertation before a panel of examiners

9. COURSE OUTLINES

FIRST SEMESTER (COMPULSORY COURSES)

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 801	Information Systems Concepts	2	1	0	3
IFS 803	Advanced Database Management Systems	2	0	3	3
IFS 805	Programming for Information Systems	2	0	3	3
	Six credit units of required courses				6
	Total				**15**

FIRST SEMESTER (REQUIRED COURSES): Students are to take six (6) credit course units

(i) Management of Business Information Systems

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 807	Business Information Technology Fundamentals	2	0	0	2
IFS 809	Enterprise Systems and Applications	2	0	0	2
IFS 811	Data Analytics for Business Decision Making	2	0	0	2

(ii) Business Analytics

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 813	Foundations of Business Analytics	2	0	0	2
IFS 815	Data Mining and Predictive Modeling	2	0	0	2
IFS 817	Statistical Analysis for Business	2	0	0	2

(iii) Intelligent Information Systems and Artificial Intelligence

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 819	Introduction to Artificial Intelligence and Machine Learning	2	0	0	2
IFS 821	Data Science and Analytics	2	0	0	2
IFS 823	Human-Computer Interaction	2	0	0	2

(iv) Health Informatics

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 825	Healthcare Informatics Standards and Interoperability	2	0	0	2
IFS 827	Healthcare Data Management	2	0	0	2
IFS 829	Healthcare Information Systems	2	0	0	2

SECOND SEMESTER (COMPULSORY COURSES)

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 802	Cybersecurity and Information Assurance	2	**1**	**0**	**3**
IFS 804	Business Intelligence and Data Analytics	**2**	**0**	3	3
IFS 806	Information Systems Strategy and Governance	**2**	**1**	**0**	3
	Six credit units of required courses				6
	Total				15

SECOND SEMESTER (REQUIRED COURSES): Students are to take six (6) credit course units

(v) Management of Business Information Systems

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 808	IT Governance and Compliance	2	0	0	2
IFS 810	Digital Marketing and eCommerce	2	0	0	2
IFS 812	Business Process Reengineering	2	0	0	2

(vi) Business Analytics

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 814	Advanced Business Analytics Techniques	2	0	0	2
IFS 816	Business Intelligence and Decision Support Systems	2	0	0	2
IFS 818	Big Data Analytics and Business Intelligence	2	0	0	2

(vii) Intelligent Information Systems and Artificial Intelligence

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 820	Advanced Artificial Intelligence and Machine Learning	2	0	0	2
IFS 824	Natural Language Processing	2	0	0	2
IFS 826	Cybersecurity in Intelligent Systems	2	0	0	2

(viii) Health Informatics

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 828	Health Information Privacy and Security	2	0	0	2
IFS 830	Telemedicine and Remote Patient Monitoring	2	0	0	2
IFS 832	Health Informatics Project Management	2	0	0	2

THIRD SEMESTER (COMPULSORY COURSE FOR ALL OPTIONS)

COURSE CODE	COURSE TITLE	L	T	P	U
IFS 899	Master's Research Dissertation	0	0	36	12

10. COURSE SYNOPSES

IFS 801 Information Systems Concepts (3 Units)

The course offers a comprehensive exploration of the foundational principles, components, and applications within the realm of Information Systems (IS). Delving into the pivotal role IS plays in contemporary organizations, students will investigate its multifaceted aspects, including hardware, software, databases, networks, and their intricate interplay. Through theoretical study and practical exercises, learners will grasp the essentials of IS development, implementation, and management, gaining proficiency in system analysis, design, and strategic alignment with organizational objectives. Additionally, the course surveys emerging trends and technologies in IS, ensuring students stay abreast of advancements such as cloud computing, big data analytics, and artificial intelligence. Ultimately, the course equips students with the knowledge and skills essential for navigating the dynamic landscape of information systems and leveraging technology to drive organizational success.

IFS 802 Cybersecurity and Information Assurance (3 Units)

The course provides a comprehensive examination of the principles, strategies, and practices essential for safeguarding digital assets and ensuring the integrity, confidentiality, and availability of information systems. Through a blend of theoretical study and practical applications, students will delve into the intricacies of cybersecurity, exploring topics such as threat detection and mitigation, risk assessment, encryption techniques, and incident response protocols. Emphasis will be placed on understanding legal and ethical considerations in cybersecurity, compliance with industry standards and regulations, and the development of robust information security policies. By the end of the course, students will possess the knowledge and skills necessary to effectively identify, assess, and mitigate cybersecurity risks, protecting organizations from cyber threats and ensuring the resilience of their information systems.

IFS 803 Advanced Database Management Systems (3 Units)

The course offers an in-depth exploration of advanced concepts and techniques essential for the design, implementation, and optimization of modern database systems. Through a combination of theoretical study and hands-on exercises, students will delve into topics such as database architecture, data modeling, query optimization, and transaction management. Emphasis will be placed on understanding emerging trends and technologies in database management, including distributed databases, NoSQL databases, and in-memory databases. Additionally, students will gain practical experience in designing and implementing database solutions for complex real-world scenarios, equipping them with the skills necessary to address the evolving challenges of data management in contemporary organizations.

IFS 804 Business Intelligence and Data Analytics (3 Units)

The course provides a comprehensive understanding of the principles, techniques, and applications vital for extracting actionable insights from vast datasets to drive informed decision-making in organizations. Through a combination of theoretical study and practical exercises, students will explore the entire data analytics process, including data collection, cleansing, modeling, analysis, and visualization. Special emphasis will be placed on advanced analytics methods, such as predictive modeling, machine learning, and data mining, enabling students to uncover trends, patterns, and correlations in complex data sets. Moreover, students will gain proficiency in utilizing industry-standard business intelligence tools and technologies to transform raw data into meaningful and actionable information, thereby empowering organizations to optimize operations, enhance performance, and gain a competitive advantage in the dynamic business landscape.

IFS 805 Programming for Information Systems (3 Units)

This course offers a comprehensive introduction to programming languages and concepts essential for designing, implementing, and managing information systems. Through a blend of theoretical instruction and hands-on programming exercises, students will develop proficiency in fundamental programming languages such as Python, Java, and SQL, with a focus on their applications in database management, web development, and system automation. Emphasis will be placed on understanding programming paradigms, data structures, algorithms, and best practices for software development within the context of information systems. By the end of the course, students will possess the skills necessary to design and implement robust, scalable, and efficient software solutions to address the diverse needs of organizations in various domains.

IFS 806 Information Systems Strategy and Governance (3 Units)

The course delves into the intricate frameworks and methodologies essential for aligning information systems (IS) with overarching organizational strategies while ensuring effective governance and risk management. Through a blend of theoretical exploration and practical case studies, students will examine topics such as IT governance structures, strategic planning processes, regulatory compliance, and cybersecurity protocols. Emphasizing the strategic role of IS in driving business objectives, students will gain insights into crafting resilient IS strategies that foster innovation, mitigate risks, and enhance organizational performance. By the course's conclusion, students will possess the acumen to navigate the dynamic landscape of IS strategy and governance, equipped to devise and implement robust frameworks that propel organizational success in an increasingly digital world.

IFS 807 Business Information Technology Fundamentals (2 Units)

The course provides students with a foundational understanding of the essential principles and practices in the intersection of business and technology. Through a combination of theoretical study and practical applications, students will explore topics such as business processes, information systems, and technological innovations that underpin modern organizations. Emphasis will be placed on understanding how technology can be leveraged to streamline business operations, enhance decision-making, and drive innovation. Additionally, students will gain hands-on experience with business software applications and tools, enabling them to analyze business problems, develop technology-based solutions, and communicate effectively with stakeholders across various organizational functions. By the end of the course, students will possess the knowledge and skills necessary to navigate the dynamic landscape of business technology and contribute effectively to organizational success.

IFS 808 IT Governance and Compliance (2 Units)

The course "IT Governance and Compliance" offers students a comprehensive understanding of the frameworks, principles, and practices necessary for ensuring effective governance and regulatory compliance within information technology (IT) environments. Through a blend of theoretical exploration and practical case studies, students will delve into topics such as IT governance structures, regulatory requirements, risk management frameworks, and audit processes. Emphasis will be placed on understanding the role of IT governance in aligning IT strategies with organizational objectives, managing IT-related risks, and ensuring accountability and transparency in IT operations. Additionally, students will examine compliance standards and regulations such as GDPR, HIPAA, and SOX, learning how to implement controls and measures to achieve and maintain compliance. By the course's conclusion, students will possess the knowledge and skills necessary to design and implement robust IT governance frameworks and compliance programs that support organizational goals and mitigate risks effectively.

IFS 809 Enterprise Systems and Applications (2 Units)

The course provides students with a comprehensive understanding of the principles, architectures, and applications of enterprise systems in modern organizations. Through a combination of theoretical study and practical hands-on exercises, students will explore the functionalities and integration of enterprise systems such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM), and Human Capital Management (HCM). Emphasis will be placed on understanding how these systems streamline business processes, enhance decision-making, and improve organizational efficiency and effectiveness. Additionally, students will gain practical experience in implementing and configuring enterprise systems, enabling them to address real-world business challenges and opportunities. By the end of the

course, students will possess the knowledge and skills necessary to design, implement, and manage enterprise systems that support organizational goals and drive competitive advantage in today's dynamic business environment.

IFS 810 Digital Marketing and eCommerce (2 Units)

The course provides students with a comprehensive understanding of the strategies, tools, and techniques essential for success in the digital marketplace. Through a combination of theoretical study and practical applications, students will explore key concepts such as search engine optimization (SEO), social media marketing, email marketing, content marketing, and online advertising. Emphasis will be placed on understanding how these digital marketing channels can be leveraged to drive traffic, generate leads, and increase sales on eCommerce platforms. Additionally, students will gain hands-on experience in developing and executing digital marketing campaigns, optimizing conversion funnels, and analyzing campaign performance metrics. By the end of the course, students will possess the knowledge and skills necessary to design and implement effective digital marketing strategies that drive growth and profitability in eCommerce businesses.

IFS 811 Data Analytics for Business Decision Making (2 Units)

The course provides students with a comprehensive understanding of how data analytics techniques can be applied to drive informed decision-making in business contexts. Through a combination of theoretical study and practical applications, students will explore various data analytics methods such as descriptive, diagnostic, predictive, and prescriptive analytics. Emphasis will be placed on understanding how to collect, preprocess, analyze, and visualize data to extract actionable insights that support strategic and operational decision-making. Additionally, students will gain hands-on experience with data analytics tools and platforms, enabling them to conduct data-driven analyses and communicate findings effectively to stakeholders. By the end of the course, students will possess the knowledge and skills necessary to leverage data analytics to solve complex business problems, optimize processes, and gain a competitive edge in the marketplace.

IFS 812 Business Process Reengineering (2 Units)

The course offers students a comprehensive understanding of the principles, methodologies, and techniques essential for redesigning and optimizing business processes to achieve dramatic improvements in efficiency, effectiveness, and competitiveness. Through a blend of theoretical study and practical applications, students will explore key concepts such as process mapping, analysis, and redesign, as well as change management and organizational transformation. Emphasis will be placed on understanding how to identify inefficiencies and bottlenecks in existing processes, reimagining them from a customer-centric perspective, and leveraging technology and innovation to drive process improvements. Additionally, students will gain hands-on exp3erience in analyzing real-world case studies and implementing process reengineering initiatives, enabling them to lead successful process improvement projects in their organizations. By the end of the course, students will possess the knowledge and skills necessary to drive transformative change and achieve operational excellence through business process reengineering.

IFS 813 Foundations of Business Analytics (2 Units)

The course provides students with a solid introduction to the fundamental concepts, techniques, and applications of business analytics in contemporary organizations. Through a combination of theoretical exploration and practical exercises, students will delve into key topics such as data collection and preprocessing, exploratory data analysis, statistical modeling, and predictive analytics. Emphasis will be placed on understanding how business analytics can be used to extract actionable insights from data to support strategic decision-making, optimize operations, and gain a competitive advantage. Additionally, students will gain hands-on experience with analytics tools and software, enabling them to analyze real-world datasets and communicate findings effectively to stakeholders. By the end of the course, students will possess the foundational knowledge and skills necessary to leverage business analytics effectively to drive business success in today's data-driven world.

IFS 814 Advanced Business Analytics Techniques (2 Units)

The course builds upon foundational knowledge to equip students with advanced skills in data analysis and interpretation, essential for addressing complex business challenges. Through a blend of theoretical exploration and practical applications, students will delve into sophisticated analytics techniques such as machine learning, predictive modeling, and optimization. Emphasis will be placed on understanding how to apply these

techniques to extract actionable insights from large and diverse datasets, enabling informed decision-making and strategic planning. Additionally, students will gain hands-on experience in using advanced analytics tools and software to analyze real-world data and develop predictive models. By the end of the course, students will possess the expertise necessary to tackle complex business problems, drive innovation, and create value through data-driven insights.

IFS 815 Data Mining and Predictive Modeling (2 Units)

The course provides students with a comprehensive understanding of the principles, techniques, and applications of data mining and predictive modeling in extracting valuable insights from large datasets. Through a blend of theoretical study and practical applications, students will explore key concepts such as data preprocessing, feature selection, and model evaluation. Emphasis will be placed on understanding various data mining algorithms, including classification, regression, clustering, and association rule mining, and their applications in solving real-world business problems. Additionally, students will gain hands-on experience in using data mining tools and software to analyze datasets and develop predictive models for forecasting, classification, and segmentation. By the end of the course, students will possess the knowledge and skills necessary to leverage data mining and predictive modeling techniques effectively to drive decision-making and gain a competitive advantage in today's data-driven business environment.

IFS 816 Business Intelligence and Decision Support Systems (2 Units)

The course offers students a comprehensive understanding of how businesses can leverage data and technology to enhance decision-making processes. Through a combination of theoretical study and practical applications, students will explore key concepts such as data warehousing, online analytical processing (OLAP), data visualization, and decision support systems (DSS). Emphasis will be placed on understanding how these technologies can be used to analyze and interpret large datasets, generate actionable insights, and support strategic and operational decision-making in organizations. Additionally, students will gain hands-on experience with business intelligence tools and software, enabling them to develop and implement decision support systems that meet the diverse needs of stakeholders across different business functions. By the end of the course, students will possess the knowledge and skills necessary to harness the power of business intelligence and decision support systems to drive innovation, optimize processes, and gain a competitive advantage in the marketplace.

IFS 817 Statistical Analysis for Business (2 Units)

The course provides students with a foundational understanding of statistical methods and their applications in solving business problems. Through a combination of theoretical study and practical exercises, students will explore key statistical concepts such as probability theory, hypothesis testing, regression analysis, and correlation. Emphasis will be placed on understanding how statistical techniques can be used to analyze data, make informed decisions, and identify trends and patterns in business environments. Additionally, students will gain hands-on experience in using statistical software to conduct data analysis and interpret results. By the end of the course, students will possess the knowledge and skills necessary to apply statistical analysis effectively to solve a wide range of business challenges and inform decision-making processes.

IFS 818 Big Data Analytics and Business Intelligence

The course offers students an in-depth exploration of the principles, methodologies, and tools necessary for leveraging big data to drive business insights and decision-making. Through a blend of theoretical study and practical applications, students will delve into key concepts such as data collection, preprocessing, storage, analysis, and visualization. Emphasis will be placed on understanding how big data technologies such as Hadoop, Spark, and NoSQL databases can be used to process and analyze large volumes of data efficiently. Additionally, students will gain hands-on experience with business intelligence tools and platforms, enabling them to derive actionable insights from big data and communicate findings effectively to stakeholders. By the end of the course, students will possess the knowledge and skills necessary to harness the power of big data analytics and business intelligence to drive innovation, optimize processes, and gain a competitive advantage in the marketplace.

IFS 819 Introduction to Artificial Intelligence and Machine Learning (2 Units)

This course provides a foundational overview of artificial intelligence (AI) and machine learning (ML), exploring the core concepts, techniques, and applications that define

these fields. Students will learn about the history and evolution of AI, the difference between AI and ML, and the various types of machine learning including supervised, unsupervised, and reinforcement learning. The course covers fundamental algorithms such as decision trees, support vector machines, and neural networks, alongside essential topics like data preprocessing, feature selection, and model evaluation. Through lectures, hands-on projects, and case studies, students will gain practical experience in applying AI and ML techniques to solve real-world problems, preparing them for more advanced studies in intelligent systems.

IFS 820 Advanced Artificial Intelligence and Machine Learning

This course offers an in-depth exploration of advanced concepts and techniques in artificial intelligence (AI) and machine learning (ML), designed for students with a foundational understanding of these fields. Topics covered include deep learning, reinforcement learning, and natural language processing, with a focus on cutting-edge algorithms such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), and generative adversarial networks (GANs). Students will delve into advanced model optimization techniques, transfer learning, and the ethical implications of AI. The curriculum emphasizes hands-on experience through complex projects and case studies, using state-of-the-art frameworks and tools like TensorFlow, PyTorch, and Keras. By the end of the course, students will be equipped to tackle sophisticated AI and ML problems, innovate in their applications, and contribute to the advancement of these dynamic fields.

IFS 821 Data Science and Analytics (2 Units)

This course delves into the principles and practices of data science and analytics, providing students with the skills needed to analyze and interpret complex data sets. The curriculum covers statistical methods, data mining techniques, and the use of big data technologies to extract meaningful insights from large volumes of data. Students will learn about data collection, cleaning, and preprocessing, as well as advanced analytics methods such as predictive modeling, clustering, and classification. The course emphasizes practical application, with hands-on projects involving popular tools and languages like Python, R, and SQL, as well as data visualization techniques to effectively communicate findings. By the end of the course, students will be adept at using data-driven approaches to support decision-making and solve real-world problems across various industries.

IFS 822 Natural Language Processing (2 Units)

This course provides a comprehensive introduction to the techniques and applications of Natural Language Processing (NLP), a key area in artificial intelligence focused on enabling computers to understand, interpret, and generate human language. Students will explore fundamental concepts such as tokenization, part-of-speech tagging, and named entity recognition, as well as advanced topics including sentiment analysis, machine translation, and text generation. The curriculum includes hands-on experience with NLP tools and libraries, such as NLTK, spaCy, and transformers, allowing students to build and deploy models for real-world applications. By integrating theory with practical exercises, students will develop the skills to tackle complex language-related challenges and leverage NLP technologies to enhance communication between humans and machines.

IFS 823 Human-Computer Interaction (2 Units)

This course explores the design and evaluation of user interfaces, focusing on the interaction between humans and computers. Students will learn about the principles of user-centered design, usability, and accessibility, as well as the cognitive and psychological factors that influence how users interact with technology. The curriculum covers methods for conducting user research, prototyping, and usability testing, along with techniques for designing intuitive and effective interfaces. Through a combination of lectures, case studies, and hands-on projects, students will gain practical experience in creating and assessing user interfaces for a variety of applications, from web and mobile apps to emerging technologies like virtual reality and wearable devices. The course aims to equip students with the skills to design technology that enhances user experience and meets the needs of diverse user populations.

IFS 824 Cybersecurity in Intelligent Systems (2 Units)

This course examines the intersection of cybersecurity and intelligent systems, focusing on protecting AI and machine learning applications from potential threats and vulnerabilities. Students will learn about common cybersecurity risks specific to intelligent systems, including adversarial attacks, data poisoning, and model inversion. The curriculum covers fundamental principles of cybersecurity, such as encryption, access control, and intrusion detection, while also addressing security challenges unique to AI, such as safeguarding sensitive

data and ensuring the integrity of AI models. Through practical labs and case studies, students will gain hands-on experience in implementing security measures, conducting vulnerability assessments, and developing strategies to mitigate risks in intelligent systems. The course aims to equip students with the knowledge and skills necessary to design and maintain secure AI applications in a rapidly evolving technological landscape.

IFS 825 Healthcare Informatics Standards and Interoperability (2 Units)

The course "Healthcare Informatics Standards and Interoperability" provides students with an in-depth exploration of the standards, protocols, and methodologies essential for achieving interoperability and data exchange within healthcare information systems. Through a combination of theoretical study and practical applications, students will delve into key concepts such as Health Level Seven (HL7), Fast Healthcare Interoperability Resources (FHIR), and Clinical Document Architecture (CDA). Emphasis will be placed on understanding how these standards facilitate the seamless exchange of clinical and administrative data between disparate healthcare systems and stakeholders. Additionally, students will explore interoperability challenges, governance frameworks, and best practices for implementing interoperable healthcare solutions. By the end of the course, students will possess the knowledge and skills necessary to design and implement interoperable healthcare information systems that improve patient care, enhance efficiency, and drive innovation in healthcare delivery.

IFS 826 Health Information Privacy and Security (2 Units)

The course offers students a comprehensive understanding of the principles, regulations, and best practices essential for safeguarding sensitive health information in digital healthcare environments. Through a blend of theoretical exploration and practical applications, students will delve into key concepts such as the Health Insurance Portability and Accountability Act (HIPAA), electronic health record (EHR) security, risk management, and incident response. Emphasis will be placed on understanding the importance of protecting patient privacy and maintaining the confidentiality, integrity, and availability of health information. Additionally, students will gain hands-on experience in assessing security risks, implementing security controls, and developing policies and procedures to ensure compliance with healthcare privacy and security regulations. By the end of the course, students will possess the knowledge and skills necessary to effectively safeguard health information, mitigate security risks, and maintain compliance with regulatory requirements in healthcare organizations

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IFS 827 Healthcare Data Management (2 Units)

The course provides students with a comprehensive understanding of the principles, practices, and technologies essential for effectively managing healthcare data throughout its lifecycle. Through a blend of theoretical study and practical applications, students will explore key concepts such as data governance, data quality, data integration, and data security in the context of healthcare information systems. Emphasis will be placed on understanding the unique challenges and requirements of healthcare data management, including regulatory compliance, interoperability, and patient privacy. Additionally, students will gain hands-on experience in utilizing healthcare data management tools and platforms to collect, store, analyze, and exchange healthcare data securely and efficiently. By the end of the course, students will possess the knowledge and skills necessary to design and implement robust healthcare data management strategies that support clinical decision-making, improve patient care, and drive innovation in healthcare delivery.

IFS 828 Telemedicine and Remote Patient Monitoring (2 Units)

The course provides students with a comprehensive understanding of the technologies, practices, and regulations essential for delivering healthcare services remotely and monitoring patient health outside traditional clinical settings. Through a combination of theoretical study and practical applications, students will explore key concepts such as telehealth platforms, virtual consultations, wearable devices, and remote monitoring systems. Emphasis will be placed on understanding how telemedicine and remote patient monitoring technologies can improve access to healthcare, enhance patient outcomes, and reduce healthcare costs. Additionally, students will examine legal and ethical considerations, reimbursement policies, and interoperability challenges associated with telemedicine and remote patient monitoring. By the end of the course, students will possess the knowledge and skills necessary to design, implement, and evaluate telemedicine and remote patient monitoring programs that meet the diverse needs of patients and healthcare providers.

IFS 829 Healthcare Information Systems (2 Units)

The course offers students a comprehensive exploration of the design, implementation, and management of information systems in healthcare settings. Through a combination of theoretical study and practical applications, students will delve into key concepts such as electronic health records (EHRs), health information exchanges (HIEs), clinical decision support systems (CDSS), and patient management systems. Emphasis will be placed on understanding how these systems integrate to improve healthcare delivery, enhance patient outcomes, and streamline operations. Additionally, students will examine issues related to system interoperability, data privacy, regulatory compliance, and the impact of emerging technologies. By the end of the course, students will possess the knowledge and skills necessary to evaluate, select, and manage healthcare information systems effectively, ensuring they meet the strategic objectives of healthcare organizations and address the needs of healthcare professionals and patients.

IFS 830 Health Informatics Project Management (2 Units)

The course equips students with the essential knowledge and skills to effectively plan, execute, and manage health informatics projects within healthcare organizations. Through a combination of theoretical study and practical applications, students will explore key concepts such as project lifecycle management, stakeholder engagement, resource allocation, risk management, and quality assurance. Emphasis will be placed on understanding the unique challenges of managing projects in the health informatics domain, including regulatory compliance, data security, interoperability, and change management. Additionally, students will gain hands-on experience with project management tools and methodologies tailored to health informatics projects, such as Agile and Waterfall. By the end of the course, students will be prepared to lead successful health informatics projects that enhance healthcare delivery, improve patient outcomes, and foster innovation in the healthcare industry.

IFS 899 Master's Research Dissertation (12 units)

This provides students with the opportunity to apply their academic knowledge and research skills to a comprehensive, independent research project within their field of study. Through this course, students will engage in the entire research process, from identifying a significant research question to conducting a literature review, designing and implementing a research methodology, analyzing data, and presenting their findings. Emphasis will be placed on developing critical thinking, problem-solving abilities, and scholarly communication skills. Students will work under the guidance of faculty advisors to ensure academic rigor and relevance to current industry challenges. By the end of the course, students will produce a substantive research paper or project report that demonstrates their ability to conduct original research and contribute to the body of knowledge in their discipline.

CURRICULUM FOR PROFESSIONAL MASTER IN BUSINESSS COMPUTING AND INFORMATION SYSTEMS (BCIS)

1. **PROGRAMME OFFERED:** Business Computing and Information Systems (BCIS)

2. PROGRAMME PHILOSOPHY

There is an increasing need within the computing industry for professionals in business analysis, web design, system development and project management, as well as IT support and training. This Professional Master in Business Computing and Information Systems is designed to meet those needs. Explore software tools and techniques and systems modelling, alongside options that range from data warehousing and project management to developing mobile apps. By offering a solid foundation in modern software tools and the principles of good software engineering will provide the skills needed to seek exciting new job opportunities. Graduates from this Business Computing and Information Systems course will be equipped for employment in industry, commerce or research with a proficiency in the key theoretical and practical areas in computing, including their application to modern information systems development.

3. PROGRAMME OBJECTIVES

The objectives of the programme are to:

i. develop and give professional training (practical and theoretical) in all areas of Business Computing and Information Systems for the purpose of job placement and enhancement industries and self-employment;

ii. expose the students to current research and up-to-date methodologies in Business Computing and Information Systems;
iii. increase the understanding of the students in current applications of Business Computing and Information Systems methodology to solving real-life problems;
iv. equip with the protection knowledge of critical infrastructure in BCIS; and
v. develop manpower in the area of Business Computing and Information Systems for the sustenance of professional practice in industries, governmental and non-governmental organizations.

4. PROGRAMME JUSTIFICATION

The field of Business Computing and Information Systems is dynamic and always experience new inventions, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Moreover, the demand for BCIS programme has risen in recent times due to these evolving discoveries. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

i. Candidates must possess good Bachelor's degree in any related discipline from a recognised University with a minimum of 2 year working experience.
ii. Third Class Bachelor degree or Holder of HND with a minimum of lower credit from recognized University or Polytechnics respectively and other Institutions with Post Graduate Diploma (PGD) Lower Credit may be considered.

6. PROGRAMME DURATION

The Business Computing and Information Systems programme is expected to last for a minimum of 12 months and a maximum of 18 months.

7. GRADUATION REQUIREMENTS

To be eligible for the award of Masters Degree in Business Computing and Information Systems, a candidate must have:

a. passed all core courses and successfully completed the project work
b. passed a minimum of 36 credit units, made up as follows:
   i 30 credit units in core courses;
   ii 6 credit units in research project; and
   Iii. fulfill other requirements from Post Graduate School.

In addition, the candidate after carrying out satisfactorily a supervised project in any chosen specialization area of Business Computing and Information Systems must submit the required number of copies of project; and pass satisfactorily an oral examination on the project before a panel of examiners.

8. COURSE OUTLINE

FIRST SEMESTER

Course Code	Status	Course Title	L	T	P	U
PIFS 871	C	Fundamentals of Information Systems	2	0	0	2
PIFS 873	C	System Design and Development	2	0	3	3
PIFS 875	C	Business Models and Innovation	2	0	0	2
PIFS 877	C	Data Analytics and Business Intelligence	2	0	3	3
PIFS 879	C	Information Security	2	0	0	2
PIFS 881	C	Web Application Development	2	0	3	3
Total						**15**

SECOND SEMESTER

Course Code	Status	Course Title	L	T	P	U
PIFS 872	C	Software Development and Engineering	2	0	3	3
PIFS 874	C	Ethics and Legal Issues in IS	2	0	0	2
PIFS 876	C	Advanced Database Systems	2	0	3	3
PIFS 878	C	Information Management Systems	2	0	0	2
PIFS 880	C	Application of Artificial Intelligence and Machine Learning in Information Systems	2	0	3	3
PIFS 882	C	eCommerce	2	0	0	2

		Technology				
PIFS 889	C	Research Project	0	0	18	6
		Total				**21**

9. COURSE SYNOPSES

PIFS 871 Fundamental of Information Systems 2 Units)

Introduction to computer software, hardware, and networking technologies. Information technology systems model. A brief introduction to information technologies – human computer interaction, information management; networking, platform technologies, programming, and web systems and technologies; Data versus information; History of information technology and the internet; Information technology application domains; Security, privacy, policy, and other social issues inherent in Information technology development and use; Future trends in information technology, problems on mining, visualization, natural language processing and Blockchain.

PIFS 872 Software Development and Engineering (3 Units)

The Software Development and Engineering course provides a comprehensive exploration into the principles, methodologies, and best practices essential for building robust and scalable software systems. Through a combination of theoretical lectures, hands-on projects, and collaborative exercises, students will gain proficiency in key areas such as software design, algorithm development, version control, testing, debugging, and documentation. Emphasizing both individual and team-based approaches, the course will cover various software development methodologies including Agile, Scrum, and DevOps, equipping participants with the skills needed to navigate the entire software development lifecycle efficiently. By the conclusion of the course, students will have acquired the knowledge and practical expertise necessary to design, develop, and maintain high-quality software solutions that meet user requirements and industry standards effectively.

PIFS 873 System Design and Development (3 Units)

Overview of analysis and design of systems; Development life cycle. System planning and requirements determination; Feasibility study. Structured analysis tools such as data flow diagrams (DFD); data dictionary, decision trees and pseudocode. Guidelines for selecting appropriate tools. System design of inputs and outputs, types of system design such as file organization, file access. Documentation control, types of documentations-user and system; Design strategies: top-down and bottom-up and Structured design, factors affecting system complexity. Forms design; Testing and Quality assurance; System implementation; System Audit considerations; Security control measures and risk analysis; File and database design, user interfaces, and comparison of structured and object-oriented design; Case studies that promote critical-thinking skills provide the context for these techniques; Object-oriented approach, and Features of object-oriented system structured approach vs. Object-oriented approach; Unified Modeling Language (UML); operations performed on objects and uses; Static models, dynamic models; Object oriented system development life cycle and object oriented systems development activities; Role of system analyst and attributes of a systems analyst.

PIFS 874 Ethics and Legal Issues in IS (2 Units)

Social, ethical, legal, and managerial issues in the application of information Systems (IS) in government, organisations, and industry; Foundations of intellectual property; Ownership of information; Plagiarism, Software piracy; Fairness in the workplace; Digital millennium copyright act; Patents; Trademarks and trade secrets; Legal issues in computing; Organisational context; professional and ethical issues and responsibilities; Relationships with professional societies; Codes of professional conduct; Ethics and history of ethics; Whistleblowing. Workplace issues (harassment, discrimination); Identify theft; Ethical hacking; Privacy and civil liberties organisations.

PIFS 875 Business Models and Innovation

An innovative product may be a feat of engineering, but that does not automatically turn it into a commercial success. What makes the difference between success in the lab and success in the marketplace is the business model. How will you create and deliver value for your customers? How will you extract some of that value for your organization? The business model encompasses your product or service, your customers, and the economic engine that will enable you to meet your profitability and growth objectives. Business model analysis is important for startups, new and established businesses which need to discover, defend or evolve their business models. This course introduces a structured way to think about, analyze, and develop a

sound business model. Topics include entrepreneurial thinking; innovation management; opportunity spotting and evaluation; industry and market research; business strategy; business models and business plans; financial forecasting and entrepreneurial finance; pitching to resource providers and negotiating

PIFS 876 Advanced Database Systems (3 Units)

The Advanced Database Systems course delves into cutting-edge concepts and technologies essential for managing and analyzing large-scale and complex data sets. Students will explore advanced database topics such as distributed databases, parallel databases, and object-oriented databases, as well as emerging paradigms like Big Data and NoSQL databases. Through a combination of theoretical discussions and hands-on projects, participants will gain expertise in designing and implementing scalable database solutions capable of handling massive volumes of structured and unstructured data. Additionally, the course will cover topics related to data warehousing, data mining, and advanced analytics techniques tailored for Big Data environments. By the conclusion of the course, students will be equipped with the skills and insights needed to address the challenges posed by modern data-intensive applications and leverage advanced database technologies effectively to extract actionable insights and drive innovation.

PIFS 877 Data Analytics and Business Intelligence (3 Units)

The Data Analytics and Business Intelligence course offers a comprehensive exploration of the methods, tools, and techniques used to extract insights from data and drive informed decision-making within organizations. Through a blend of theoretical concepts and practical applications, students will learn how to collect, clean, analyze, and interpret data sets using statistical and machine learning approaches. Topics covered include data visualization, exploratory data analysis, predictive modeling, and data-driven decision-making frameworks. Emphasizing real-world business applications, the course will also delve into the role of business intelligence tools and platforms in transforming raw data into actionable insights for strategic planning, optimization, and performance evaluation. By the conclusion of the course, students will possess the skills and knowledge needed to leverage data analytics and business intelligence effectively to gain competitive advantages and drive organizational success.

PIFS 878 Information Management Systems (2 Units)

The Information Management Systems course provides a comprehensive overview of the principles, techniques, and technologies essential for organizing, storing, retrieving, and analyzing vast amounts of information within organizational contexts. Students will explore key concepts such as data modeling, database management systems, data warehousing, business intelligence, and knowledge management. Through a combination of theoretical discussions and hands-on practical exercises, participants will learn how to design and implement information systems that support decision-making processes, enhance organizational efficiency, and facilitate strategic planning. Additionally, the course will cover emerging trends and technologies in information management, including big data analytics, machine learning, and data visualization. By the end of the course, students will have acquired the skills and insights necessary to harness the power of information effectively to drive innovation and competitive advantage in diverse business environments

PIFS 879 Information Security (2 Units)

Basic concepts: cyber, security, confidentiality, integrity, availability, authentication, access control, and non-repudiation methodologies for implementing security; Security policies, best current practices, testing security, and incident response; Risk management, disaster recovery and access control; Basic cryptography and software application vulnerabilities; Evolution of cyber-attacks; Operating system protection mechanisms and intrusion detection systems; Basic concepts on formal models of security, cryptography and steganography; Basics of Network and distributed system security, denial of service, attack strategies; Secure applications on transfer of funds and any other functions across networks; Cybersecurity policy and guidelines; Main actors of cyberspace and cyber operations; Impact of cybersecurity on civil and military institutions, privacy, business and government applications; Examination of the dimensions of networks, protocols, operating systems, and associated applications; Methods and motives of cybersecurity incident perpetrators, and the countermeasures employed by organisations and agencies to prevent and detect those incidences. Ethical obligations of security professionals; Trends and development in cybersecurity; Evolution of cybersecurity and national security strategies, requirements to the typologies of cyber-attacks that require policy tools and domestic response; Cybersecurity strategies evolving in the face of big risk.

PIFS 880 Application of AI and Machine Learning in Information Systems (3 Units)

The Application of Artificial Intelligence and Machine Learning in Information Systems course offers an in-depth exploration into leveraging AI and ML techniques to enhance the capabilities of information systems across various domains. Students will delve into foundational AI and ML concepts such as neural networks, decision trees, clustering algorithms, and reinforcement learning. Through hands-on projects and case studies, participants will learn how to apply these techniques to tasks such as natural language processing, image recognition, recommendation systems, and predictive analytics. Emphasizing practical applications and real-world scenarios, the course will equip students with the skills to develop intelligent systems that automate processes, extract insights from data, and improve decision-making in diverse organizational contexts. By the conclusion of the course, students will have the expertise needed to harness the power of AI and ML to drive innovation, efficiency, and competitive advantage in information systems.

PIFS 881 Web Application Development (3 Units)

Introduction to framework-based web development using a contemporary language like PHP and ASP.net. Principles of web pages (dynamic and static) and website design. The tool used in web development. Client-side and server-side languages. Creation of interactive, dynamic websites using a common web architecture and object-based database access. Design, implementation, and testing of web-based applications including related software, databases, interfaces, and digital media. Standard object models, and the use of server-side programmes for database and file access; testing, software quality assurance; and the process of publishing Web sites. Hands-on PHP and Python programming using open-source software (Apache, PHP, Python, JavaScript, and MySQL). Programming for web development includes control structures, objects, functions, and the use of composite data types. Deploying dynamic content using JavaScript. Designing and developing dynamic web pages and creating, validating, transforming, and formatting data using PHP. Hand-on PHP programming. Design of simple web pages. Creation of dynamic websites. Design of client-side and server-side programmes. Demonstration of web-based applications with database access. Use of JavaScript to develop dynamic content. Use of Python to develop dynamic web pages.

PIFS 882 eCommerce Technology (2 Units)

The eCommerce Technology course provides a comprehensive examination of the technological infrastructure, strategies, and tools essential for building and managing successful eCommerce platforms. Students will explore key topics including online storefront development, payment gateways, inventory management systems, order fulfilment processes, and customer relationship management (CRM) systems. Through a combination of theoretical insights and hands-on practical exercises, participants will gain proficiency in selecting and configuring eCommerce platforms, optimizing website performance, and implementing digital marketing and analytics strategies to drive traffic and conversions. Emphasizing industry best practices and emerging trends, the course will also cover topics such as mobile commerce, omnichannel retailing, and security considerations in eCommerce transactions. By the end of the course, students will possess the skills and knowledge necessary to design, deploy, and optimize eCommerce solutions that meet the evolving needs of businesses and consumers in the digital marketplace.

PIFS 889 Research Project (6 Units)

It includes the research methodology, analysis of data using statistical tools, performance evaluation, standard documentation of the project, referencing style, programming of the prototype/simulation model, plagiarism and grammar check, and PowerPoint presentation skill. The formal written report made up of chapters four and five approved by the supervisor will be submitted to the Department for final grading. An oral presentation is required.

CURRICULUM FOR MASTER OF PHILOSOPHY M. PHIL PROGRAMME IN INFORMATION SYSTEMS

1. PROGRAMME OFFERED: Master of Philosophy (M. Phil) in Information Systems

2. PROGRAMME PHILOSOPHY

The M.Phil. in Information Systems programme will provide sufficient understanding of organisational

processes to be able to support Information system and business applications from users or organisational perspective. The programme is designed to provide students with necessary tools for information systems techniques and logical reasoning. The curriculum emphasizes the art, science, engineering and technology of information systems. The students are developed to solve challenges as professional of information analyst in private and public organisation, industries, higher institutions of learning, government corporations and so on. The programme will produce professionals that are equipped to develop intelligent local content system solutions to solve the immediate problems in our environment.

3. PROGRAMME OBJECTIVES

The objectives of the programme are to:

i. identify technologies and trends related to Information Systems that have strategic value for an organisation and manage the implementation of those technologies;
ii. understand, design and implement security solutions related to database systems;
iii. design web and mobile applications;
iv. identify the basic tenets of computer network and communication technology;
v. define secure enterprise information system solutions utilising cloud technologies;
vi. implement responsive business enterprise system solutions on multiple computer platforms; and
vii. manage Information and communication solutions for a variety of business and industry applications.

4. PROGRAMME JUSTIFICATION

The field of Information System (IS) is dynamic and always experience new inventions, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Moreover, the demand for IS programmes has risen in recent times due to these evolving discoveries. In view of the above considerations, the department of Information System is proposing the M.Phil. Information Systems programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

The requirements for admission into the M.Phil. programme shall consist of:

(i) M.Tech. or M.Sc. in any course from the School of Computing, FUTA or related fields from other institutions with a CGPA of between 2.5 and 2.99 on a 5-point credit scale and a 50 -54%;
(ii) All applications for the M.Phil. programme shall be subjected to the School of Postgraduate Studies regulations.

6. PROGRAMME DURATION

The M.Phil. in Information Systems programme is expected to last for a minimum of 18 months and a maximum of 24 months.

7. GRADUATION REQUIREMENTS

To be eligible for the award of MPhil. degree in Information Systems, a candidate must have:

i. passed all the core courses and electives;
ii. passed a minimum of 21 credit units, made up as follows:
   - 15 credit units in core courses;
   - 6 credit units in research dissertation; and
iii. successfully presented at least two seminars – proposal and progress seminars;
iv. fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University; and
v. successfully completed and defended a research dissertation in an oral examination.

8. COURSE OUTLINES

All the courses indicated in each of the tables given below are core and required for MPhil degree in Information Systems.

FIRST SEMESTER

Course Code	Status	Course Title	L	T	P	U
IFS 881	C	Special Topics in Information Systems	2	0	0	2
IFS 883	C	Research Methodology	1	0	0	1
IFS 885	C	Advanced Database Management Systems	2	0	0	2
IFS 887	C	Programming for Information Systems	2	0	0	2
		Total				7

SECOND SEMESTER

Course Code	Status	Course Title	L	T	P	U
IFS 882	C	Information Systems Strategy and Governance	2	0	0	2
IFS 884	C	Cybersecurity and Information Assurance	2	0	0	2
IFS 886	C	Advanced Business Analytics Techniques	2	0	0	2
		Elective				2
		Total				8

Electives

IFS 888	E	Business Intelligence and Decision Support Systems	2	0	0	2
IFS 890	E	AI-driven Marketing Automation and Personalization	2	0	0	2
IFS 892	E	eCommerce Technologies and Infrastructure	2	0	0	2

THIRD SEMESTER

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
IFS 889	C	Research Dissertation	0	0	18	6
		Total				6

9. COURSE SYNOPSES

IFS 881 Special Topics in Information Systems (2 Units)

Recent topics and developments in information systems are expected to be introduced from year to year. Apart from seminars to be delivered by lecturers or guests, students are expected to do substantial readings on their own

IFS 882 Information Systems Strategy and Governance (2 Units)

The course delves into the intricate frameworks and methodologies essential for aligning information systems (IS) with overarching organizational strategies while ensuring effective governance and risk management. Through a blend of theoretical exploration and practical case studies, students will examine topics such as IT governance structures, strategic planning processes, regulatory compliance, and cybersecurity protocols. Emphasizing the strategic role of IS in driving business objectives, students will gain insights into crafting resilient IS strategies that foster innovation, mitigate risks, and enhance organizational performance. By the course's conclusion, students will possess the acumen to navigate the dynamic landscape of IS strategy and governance, equipped to devise and implement robust frameworks that propel organizational success in an increasingly digital world.

IFS 883 Research Methodology (1 Unit)

Introduction to research methods (experimental design and analysis, modelling and simulation and the likes), including research paradigms and methodologies across computer science, research question formulation, design of research approach, literature search and presentation of related work, analysis of results, verbal and written presentation skills, and research ethics. Students prepare and defend a thesis proposal or project proposal in an area of their choice.

IFS 884 Cybersecurity and Information Assurance (2 Units)

The course provides a comprehensive examination of the principles, strategies, and practices essential for safeguarding digital assets and ensuring the integrity, confidentiality, and availability of information systems. Through a blend of theoretical study and practical applications, students will delve into the intricacies of cybersecurity, exploring topics such as threat detection and mitigation, risk assessment, encryption techniques, and incident response protocols. Emphasis will be placed on understanding legal and ethical considerations in cybersecurity, compliance with industry standards and regulations, and the development of robust information security policies. By the end of the course, students will possess the knowledge and skills necessary to effectively identify, assess, and mitigate cybersecurity risks, protecting organizations from cyber threats and ensuring the resilience of their information systems.

IFS 885 Advanced Database Management Systems (2 Units)

The course offers an in-depth exploration of advanced

concepts and techniques essential for the design, implementation, and optimization of modern database systems. Through a combination of theoretical study and hands-on exercises, students will delve into topics such as database architecture, data modeling, query optimization, and transaction management. Emphasis will be placed on understanding emerging trends and technologies in database management, including distributed databases, NoSQL databases, and in-memory databases. Additionally, students will gain practical experience in designing and implementing database solutions for complex real-world scenarios, equipping them with the skills necessary to address the evolving challenges of data management in contemporary organizations.

IFS 886 Advanced Business Analytics Techniques (2 Units)

The course builds upon foundational knowledge to equip students with advanced skills in data analysis and interpretation, essential for addressing complex business challenges. Through a blend of theoretical exploration and practical applications, students will delve into sophisticated analytics techniques such as machine learning, predictive modeling, and optimization. Emphasis will be placed on understanding how to apply these techniques to extract actionable insights from large and diverse datasets, enabling informed decision-making and strategic planning. Additionally, students will gain hands-on experience in using advanced analytics tools and software to analyze real-world data and develop predictive models. By the end of the course, students will possess the expertise necessary to tackle complex business problems, drive innovation, and create value through data-driven insights.

IFS 887 Programming for Information Systems (2 Units)

This course offers a comprehensive introduction to programming languages and concepts essential for designing, implementing, and managing information systems. Through a blend of theoretical instruction and hands-on programming exercises, students will develop proficiency in fundamental programming languages such as Python, Java, and SQL, with a focus on their applications in database management, web development, and system automation. Emphasis will be placed on understanding programming paradigms, data structures, algorithms, and best practices for software development within the context of information systems. By the end of the course, students will possess the skills necessary to design and implement robust, scalable, and efficient software solutions to address the diverse needs of organizations in various domains.

IFS 888 Business Intelligence and Decision Support Systems (2 Units)

The course offers students a comprehensive understanding of how businesses can leverage data and technology to enhance decision-making processes. Through a combination of theoretical study and practical applications, students will explore key concepts such as data warehousing, online analytical processing (OLAP), data visualization, and decision support systems (DSS). Emphasis will be placed on understanding how these technologies can be used to analyze and interpret large datasets, generate actionable insights, and support strategic and operational decision-making in organizations. Additionally, students will gain hands-on experience with business intelligence tools and software, enabling them to develop and implement decision support systems that meet the diverse needs of stakeholders across different business functions. By the end of the course, students will possess the knowledge and skills necessary to harness the power of business intelligence and decision support systems to drive innovation, optimize processes, and gain a competitive advantage in the marketplace.

IFS 890 AI-driven Marketing Automation and Personalization (2 Units)

The course provides students with an in-depth exploration of how artificial intelligence (AI) technologies can revolutionize marketing strategies through automation and personalized experiences. Through a combination of theoretical study and practical applications, students will delve into key concepts such as customer segmentation, predictive analytics, recommendation systems, and natural language processing. Emphasis will be placed on understanding how AI-driven marketing automation tools can streamline marketing processes, optimize campaign performance, and enhance customer engagement. Additionally, students will gain hands-on experience in implementing AI-driven marketing solutions, utilizing platforms such as customer relationship management (CRM) systems and marketing automation software. By the end of the course, students will possess the knowledge and skills necessary to leverage AI technologies effectively to create personalized marketing experiences, drive customer satisfaction, and achieve business objectives in today's digital landscape.

IFS 892 eCommerce Technologies and Infrastructure (2 Units)

The course offers students a comprehensive understanding of the foundational technologies and infrastructure that underpin eCommerce platforms. Through a blend of theoretical study and practical applications, students will explore key concepts such as web development, database management, cloud computing, and security protocols. Emphasis will be placed on understanding how eCommerce technologies enable online transactions, product management, inventory tracking, and customer relationship management. Additionally, students will gain hands-on experience in building and deploying eCommerce solutions, utilizing platforms such as Magento, Shopify, and WooCommerce. By the end of the course, students will possess the knowledge and skills necessary to design, implement, and manage robust eCommerce platforms that meet the diverse needs of businesses and consumers in the digital marketplace.

IFS 889 Research Dissertation (6 Units)

Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organized and well-written form. The candidate is required to present at least two seminar papers before the final oral presentation.

CURRICULUM FOR MASTER OF PHILOSOPHY/DOCTOR OF PHILOSOPHY (M.PHIL/Ph.D) PROGRAMME IN INFORMATION SYSTEMS

1. **PROGRAMME OFFERED:** Master of Philosophy/Ph.D Programme in Information Systems

2. PROGRAMME PHILOSOPHY

The M.Phil./Ph.D in Information Systems programme will provide sufficient understanding of organisational processes to be able to support Information Systems applications from a user or organisational perspective. The programme is designed to provide students with necessary tools for information system techniques and logical reasoning. The curriculum emphasizes the art, science, engineering and technology of information systems. The students are developed to solve the challenges as professional information analyst in private and public organisation, industries, higher institutions of learning, government corporations and so on. The programme will produce professionals that are equipped to develop intelligent local content system solutions to solve the immediate problems in our environment.

3. PROGRAMME OBJECTIVES

The objectives of the programme are to:

i. identify technologies and trends related to Information Systems that have strategic value for an organisation and manage the implementation of those technologies;
ii. understand, design and implement security solutions related to database systems;
iii. design web and mobile applications;
iv. identify the basic tenets of computer network and communication technology;
v. define secure enterprise information system solutions utilising cloud technologies;
vi. implement responsive business enterprise system solutions on multiple computer platforms; and
vii. manage Information and communication solutions for a variety of business and industry applications.

4. PROGRAMME JUSTIFICATION

The field of Information Systems (IS) is dynamic and always experience new inventions, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Moreover, the demand for IS programmes has risen in recent times due to these evolving discoveries. In view of the above considerations, the department of Information System is proposing the M. Phil./Ph.D Information Systems programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

The requirements for admission into the M.Phil./Ph.D programme shall consist of:

(i) M.Tech. or M.Sc. in any course in School of Computing, FUTA or from other institutions with a CGPA of not less than 3.0 on a 5-point credit scale and a minimum score of 55%;

(ii) M.Tech. or M.Sc. in other related fields from other institutions with a CGPA of not less than 3.0 on a 5-point credit scale and a minimum score of 55% or as in (i) above for institutions similar to FUTA; and

(iii) All applications for the M.Phil./PhD programme shall be subjected to the School of Postgraduate Studies regulations.

6. PROGRAMME DURATION

The M. Phil./Ph.D in Information System programme is expected to last for a minimum of 18 months and a maximum of 24 months.

7. GRADUATION REQUIREMENTS

For students admitted through Master of Philosophy/Ph.D programme in Computing and Information Systems, to be eligible for the award of MPhil./Ph.D degree in Information Systems, a candidate must have:

passed a total of 12 course units and 6 research units in two semesters;

passed all the courses recommended by the Department;

successfully presented at least two seminars – proposal and progress seminars;

successfully completed and defended a conversion exam of panel constituted by the School of Postgraduate Studies.

fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University.

8. REQUIREMENT FOR TRANSFER TO Ph.D PROGRAMME IN INFORMATION SYSTEMS

A student who enters the M.Phil./Ph. D degree programme may be allowed to transfer to the Ph.D programme if he/she makes a satisfactory progress in his/her study. Such a candidate will be expected to fulfil the following requirements:

(i) completed all course work with a CGPA of not less than 3.5

(ii) successfully presented at least two seminars; proposal and progress seminars,

(iii) prepares and submits to the School of Postgraduate Studies through the Department, a research plan considered suitable for pursuing a Ph.D degree;

(iv) presents a detailed report of research work done up to the time of seeking transfer and submit to the School of Postgraduate Studies;

(v) passes an oral transfer examination to be conducted by the School of Postgraduate Studies with the panel of examiners drawn from his/her Department on the subject of the research and topics related to the field of study; and

(vi) candidate fulfils all other conditions as prescribed by the Board of School of Postgraduate Studies of the University.

9. COURSE OUTLINES

All the courses indicated in each of the tables given below are core and required for MPhil degree in Information Systems.

FIRST SEMESTER

Course Code	Status	Course Title	L	T	P	U
IFS 881	C	Special Topics in Information Systems	2	0	0	2
IFS 883	C	Research Methodology	2	0	0	2
		Elective				2
		TOTAL				6

Electives

IFS 885	E	Advanced Database Management Systems	2	0	0	2
IFS 887	E	Programming for Information Systems	2	0	0	2

SECOND SEMESTER

Course Code	Status	Course Title	L	T	P	U
IFS 882	C	Information Systems Strategy and Governance	2	0	0	2
IFS 884	C	Cybersecurity and Information Assurance	2	0	0	2
		Elective				2
		Total				6

Electives

IFS 886	E	Advanced Business Analytics Techniques	2	0	3	3
IFS 888	E	Business Intelligence and Decision Support Systems	2	0	0	2
IFS 890	E	AI-driven Marketing Automation and Personalization	2	0	0	2
IFS 892	E	eCommerce Technologies and Infrastructure	2	0	0	2

THIRD SEMESTER

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
IFS 889	C	Research Dissertation	0	0	18	6
		Total				**6**

9. COURSE SYNOPSES

IFS 881 Special Topics in Information Systems (2 Units)

Recent topics and developments in information systems are expected to be introduced from year to year. Apart from seminars to be delivered by lecturers or guests, students are expected to do substantial readings on their own

IFS 882 Information Systems Strategy and Governance (2 Units)

The course delves into the intricate frameworks and methodologies essential for aligning information systems (IS) with overarching organizational strategies while ensuring effective governance and risk management. Through a blend of theoretical exploration and practical case studies, students will examine topics such as IT governance structures, strategic planning processes, regulatory compliance, and cybersecurity protocols. Emphasizing the strategic role of IS in driving business objectives, students will gain insights into crafting resilient IS strategies that foster innovation, mitigate risks, and enhance organizational performance. By the course's conclusion, students will possess the acumen to navigate the dynamic landscape of IS strategy and governance, equipped to devise and implement robust frameworks that propel organizational success in an increasingly digital world.

IFS 883 Research Methodology (2 Units)

Introduction to research methods (experimental design and analysis, modelling and simulation and the likes), including research paradigms and methodologies across computer science, research question formulation, design of research approach, literature search and presentation of related work, analysis of results, verbal and written presentation skills, and research ethics. Students prepare and defend a thesis proposal or project proposal in an area of their choice.

IFS 884 Cybersecurity and Information Assurance (2 Units)

The course provides a comprehensive examination of the principles, strategies, and practices essential for safeguarding digital assets and ensuring the integrity, confidentiality, and availability of information systems. Through a blend of theoretical study and practical applications, students will delve into the intricacies of cybersecurity, exploring topics such as threat detection and mitigation, risk assessment, encryption techniques, and incident response protocols. Emphasis will be placed on understanding legal and ethical considerations in cybersecurity, compliance with industry standards and regulations, and the development of robust information security policies. By the end of the course, students will possess the knowledge and skills necessary to effectively identify, assess, and mitigate cybersecurity risks, protecting organizations from cyber threats and ensuring the resilience of their information systems.

IFS 885 Advanced Database Management Systems (2 Units)

The course offers an in-depth exploration of advanced concepts and techniques essential for the design, implementation, and optimization of modern database systems. Through a combination of theoretical study and hands-on exercises, students will delve into topics such as database architecture, data modeling, query optimization, and transaction management. Emphasis will be placed on understanding emerging trends and technologies in database management, including distributed databases, NoSQL databases, and in-memory databases. Additionally, students will gain practical experience in designing and implementing database solutions for complex real-world scenarios, equipping them with the skills necessary to address the evolving challenges of data management in contemporary organizations.

IFS 886 Advanced Business Analytics Techniques (2 Units)

The course builds upon foundational knowledge to equip students with advanced skills in data analysis and interpretation, essential for addressing complex business challenges. Through a blend of theoretical exploration and practical applications, students will delve into sophisticated analytics techniques such as machine learning, predictive modeling, and optimization. Emphasis will be placed on understanding how to apply these techniques to extract actionable insights from large and diverse datasets, enabling informed decision-making and strategic planning. Additionally, students will gain hands-on experience in using advanced analytics tools and software to analyze real-world data and develop predictive models. By the end of the course, students will possess the expertise necessary to tackle complex business problems, drive innovation, and create value through data-driven insights.

IFS 887 Programming for Information Systems (2 Units)

This course offers a comprehensive introduction to programming languages and concepts essential for designing, implementing, and managing information systems. Through a blend of theoretical instruction and hands-on programming exercises, students will develop proficiency in fundamental programming languages such as Python, Java, and SQL, with a focus on their applications in database management, web development, and system automation. Emphasis will be placed on understanding programming paradigms, data structures, algorithms, and best practices for software development within the context of information systems. By the end of the course, students will possess the skills necessary to design and implement robust, scalable, and efficient software solutions to address the diverse needs of organizations in various domains.

IFS 888 Business Intelligence and Decision Support Systems (2 Units)

The course offers students a comprehensive understanding of how businesses can leverage data and technology to enhance decision-making processes. Through a combination of theoretical study and practical applications, students will explore key concepts such as data warehousing, online analytical processing (OLAP), data visualization, and decision support systems (DSS). Emphasis will be placed on understanding how these technologies can be used to analyze and interpret large datasets, generate actionable insights, and support strategic and operational decision-making in organizations. Additionally, students will gain hands-on experience with business intelligence tools and software, enabling them to develop and implement decision support systems that meet the diverse needs of stakeholders across different business functions. By the end of the course, students will possess the knowledge and skills necessary to harness the power of business intelligence and decision support systems to drive innovation, optimize processes, and gain a competitive advantage in the marketplace.

IFS 890 AI-driven Marketing Automation and Personalization (2 Units)

The course provides students with an in-depth exploration of how artificial intelligence (AI) technologies can revolutionize marketing strategies through automation and personalized experiences. Through a combination of theoretical study and practical applications, students will delve into key concepts such as customer segmentation, predictive analytics, recommendation systems, and natural language processing. Emphasis will be placed on understanding how AI-driven marketing automation tools can streamline marketing processes, optimize campaign performance, and enhance customer engagement. Additionally, students will gain hands-on experience in implementing AI-driven marketing solutions, utilizing platforms such as customer relationship management (CRM) systems and marketing automation software. By the end of the course, students will possess the knowledge and skills necessary to leverage AI technologies effectively to create personalized marketing experiences, drive customer satisfaction, and achieve business objectives in today's digital landscape.

IFS 892 eCommerce Technologies and Infrastructure (2 Units)

The course offers students a comprehensive understanding of the foundational technologies and infrastructure that underpin eCommerce platforms. Through a blend of theoretical study and practical applications, students will explore key concepts such as web development, database management, cloud computing, and security protocols. Emphasis will be placed on understanding how eCommerce technologies enable online transactions, product management, inventory tracking, and customer relationship management. Additionally, students will gain hands-on experience in building and deploying eCommerce solutions, utilizing platforms such as Magento, Shopify, and WooCommerce. By the end of the course, students will possess the knowledge and skills necessary to design, implement, and manage robust eCommerce platforms that meet the diverse needs of businesses and consumers in the digital marketplace.

IFS 889 Research Dissertation (2 Units)

Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) to review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organized and well-written form. The candidate is required to present at least two seminar papers before the final oral presentation.

CURRICULUM FOR DOCTOR OF PHILOSOPHY (Ph.D) PROGRAMME IN INFORMATION SYSTEMS

1. **PROGRAMME OFFERED:** Doctor of Philosophy (Ph.D) in Information Systems

2. **AVAILABLE OPTIONS/SPECIALIZATIONS**
   i. Management of Business Information Systems
   ii. Business Analytics
   iii. Intelligent Information Systems and Artificial Intelligence
   iv. Health Informatics

3. PROGRAMME PHILOSOPHY

The last twenty years or so has seen a dramatic growth in the demand for professionals trained in information systems. This growth was partly driven by tremendous technological advances, such as the emergence of computer networking, including wireless networking, graphical user interfaces, and the Internet, the world–wide–web, and their applications. But the growth in demand was also driven by a much greater realisation on the part of many organisations and individuals of the importance of information systems for their well–being, and the more widespread use of these technologies by individuals whose primary area of expertise was not in information systems. While programme in traditional computing disciplines such as computer engineering and computer science responded to these new trends, albeit often slowly, employers started to demand skills that graduates typically did not get out of a traditional computer science or computer engineering programme. In the present age, there is a need for programme that will equip graduates with the practical network or system administration skills that organisations needed to expand and maintain their information technology infrastructures, or the web development skills required to take advantage of the many opportunities opened up by the Internet.

The Ph.D in Information Systems programme will provide sufficient understanding of organisational processes to be able to support Information systems applications from a user or organisational perspective. The programme is designed to provide students with necessary tools for computing and information technology techniques and logical reasoning. The curriculum emphasizes the art, science, engineering and technology of computing and information systems. The students are developed to solve the challenges as professional information technologists in private and public organisation, industries, higher institutions of learning, government corporations and so on. The programme will produce professionals that are equipped to develop intelligent local content system solutions to solve the immediate problems in our environment.

4. PROGRAMME OBJECTIVES

The objectives of the programme are to:

i. develop and give advanced academic and professional training (practical and theoretical) in all

areas of Information systems for the purpose of job placement in the industries and to be self-employed and create jobs;

ii. expose the students to current research and up-to-date methodologies in Information systems, and increase their understanding of the applications of Information systems methodology to solving real-life problems, protection of critical infrastructure and national assets as well as other disciplines that require the knowledge of Information systems; and

iii. develop manpower that is research-oriented in the area of Information systems for the sustenance of teaching and research in both public and private institutions of higher learning and non-governmental organizations.

5. PROGRAMME JUSTIFICATION

The field of Information Systems (IS) is dynamic and always experience new inventions, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Moreover, the demand for IS programmes has risen in recent times due to these evolving discoveries. In view of the above considerations, the Department of Information Systems is proposing the Ph.D Information Systems programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

6. ADMISSION REQUIREMENTS

Candidates seeking admission into the Ph.D programme are required to possess:

i. M. Tech degree in Information Systems or related discipline of FUTA or any other recognized University with a minimum CGPA of 3.5 on 5-point credit scale or its equivalent a minimum overall score of 60%.

ii. M. Phil degree in Information Systems of FUTA or any other recognized University with a minimum CGPA of 3.5 on 5-point credit scale or its equivalent a minimum overall score of 60%.

7. PROGRAMME DURATION

The Ph.D programme shall run for a minimum of 36 months for full-time and 48 months for part-time students.

8. GRADUATION REQUIREMENTS

To be eligible for the award of Ph.D in Computing and Information Systems, a candidate must have carryout an independent research work in his/her specialization under the general supervision of selected senior academic staff in the chosen field of research. The candidate must demonstrate high scholastic ability through the research. The thesis emanating from the research should exhibit originality and the result must form distinct contributions to knowledge. In carrying out this main requirement:

i) candidate must be in consultation with his/her supervisors, present a comprehensive research proposal seminar in the department successfully within the first year of study;

ii) candidate must also present progress seminar in the department successfully;

iii) on completion of the research, the candidate must present an end-of-thesis seminar successfully in the department.

iv) A candidate after carrying out satisfactorily post seminar review, must submit the required number of copies of thesis for a viva; and pass satisfactorily the oral examination of the submitted thesis before a panel of examiners; and

v) fulfilled all other conditions as approved by the School of Postgraduate Studies and the University.

9. IFS 999 Ph.D THESIS

Original research project, which must involve independent investigations in any of the listed fields, should make new and significant contributions to the understanding and knowledge of Information Systems. The report should be presented in form of a thesis using approved format. Every candidate must present, at least, three successful seminars before submission of Ph.D thesis report for examination.

9. LIST OF ACADEMIC STAFF

S/N	Name	Qualifications	Rank	Area of specialisation
1	Prof. R. O. Akinyede	B.Tech, M.Tech, Ph,D (Akure)	Professor/HOD	Information Systems Security, and eCommerce
2	Prof. Mrs. B. A. Ojokoh	B.Sc. (Ado), M.Tech, Ph.D(Akure)	Professor	Web Mining, Intelligent Information Management, Digital Libraries
3	Prof. Mrs. O. C. Agbonifo	B. Sc.(Ibadan), M.Tech., Ph.D(Akure)	Professor	Intelligent Systems, eLearning, Artificial Intelligence and Software Engineering
4	Prof. O. Olabode	B.Tech., M.Tech., Ph.D (Akure)	Professor (Associate)	Artificial Intelligence, Machine Learning, and eCommerce
5	Dr. E. O. Ibam	B.Sc, (Nsukka),M.Sc. (Zaria), Ph.D (Akure)	Senior Lecturer	Software Engineering, Softcomputing and eLearning
6	Prof. O. S. Adewale	B.Sc. (Ago-Iwoye), M.Tech, Ph.D (Akure)	Professor (Associate)	Computer Networks, Softcomputing, Cloud Computing, Computer Architecture
7	Prof. B. K. Alese	B.Tech., M.Tech., Ph.D (Akure)	Professor (Associate)	Information Security, Cryptography, Fault–Tolerant Computing, Computer Architecture
8	Prof. A. O. Adetunmbi	B.Tech., M.Tech., Ph.D (Akure)	Professor (Associate)	Information Security, Intrusion Detection, Language Processing
9	Prof. O. Obe	B.Tech(Akure), M.Sc. (Lagos), Ph.D (Bucharest)	Professor (Associate)	Artificial Intelligence, Control, Mobile Systems
10	Prof. G. B. Iwasokun	B.Tech, M.Tech, Ph.D (Akure)	Professor (Associate)	Biometric Security, Image Processing
11	Prof. M. B. Kuboye	B.Tech, M.Tech, Ph.D (Akure)	Professor (Associate)	Computer Networks
12	Dr. A. E. Akinwonmi	B.Sc (Lag),PGDCS, M.Tech, Ph.D (Akure)	Senior Lecturer (Associate)	Artificial Intelligence, Machine Learning, Image Processing, Computer Vision
13	Dr. O. D. Alowolodu	B.Sc. (Ado-Ekiti), M.Tech, Ph.D. (Akure)	Reader (Associate)	Cloud Computing, Computer Network Security
14	Dr. J. A. Gabriel	B.Sc (Sokoto), M.Tech, Ph.D(Akure)	Senior Lecturer (Associate)	Computer Network Security, Cryptography
15	Dr. O. Ayeni	B.Sc.Ed,(Ife),PGDCS, M.Tech, Ph.D.(Akure)	Senior Lecturer (Associate)	Intrusion Detection, Image Processing, Inform. Security
16	Dr. D. Arokoyo	MBBS (Zaria), M.Sc. (Ibadan), Ph.D (Cape Town)	Senior Lecturer (Associate)	Medicine and Surgery
17	Dr. B. O. Ibitoye	MBBS (Ilorin), M.Sc., Ph.D (Ibadan)	Lecturer I (Associate)	Reproductive Anatomy and Endocrinology
18	Dr. S. I. Olotu	B.Sc. (Ogbomoso), M.Tech, Ph.D (Akure)	Lecturer I (Associate)	Computer Networks, Soft Computing
19	Dr. A. H. Afolayan	B.Tech, M.Tech, Ph.D(Akure)	Lecturer I	Softcomputing, Machine Learning, Operations Research
20	Dr. S.P. Akinrinwa	B.Tech, M.Tech, Ph.D (Akure)	Lecturer II	Computer Networks
21	Dr. A.I. Makinde	B.Tech, M.Tech, Ph.D (Akure)	Lecturer II	Software Engineering, Machine Learning and e-Learning

9.3.4 DEPARTMENT OF SOFTWARE ENGINEERING

CURRICULUM FOR POSTGRADUATE DIPLOMA (PGD) PROGRAMME IN SOFTWARE ENGINEERING

1. PROGRAMME OFFERED: Postgraduate Diploma (PGD) in Software Engineering Technology

2. PROGRAMME PHILOSOPHY

The Postgraduate Diploma in Software Engineering

Exigencies and realities in technological development have placed increasing demands on the currency of software engineering training vis-a-vis the necessity for continuous professional development. The postgraduate diploma in Software Engineering programme will provide an opportunity for academic and professional advancement and education in computing and software engineering discipline for:

- holders of HND in software engineering or related disciplines;
- candidates intending to pursue higher degrees but whose enabling pre-requisite academic qualifications are deficient;
- candidates who are desirous to broaden their technical knowledge in order to effectively cope with increasing professional responsibilities in the places of work without necessarily leaving their jobs for full-time training programmes.

The postgraduate diploma in software engineering programme is also especially designed for professionals who would like to convert their career into software engineering field and it is unique since it is suitable for all disciplines. It provides sufficient conceptual/theoretical knowledge, and essential practical skills in key areas of software engineering.

3. PROGRAMME OBJECTIVES

The main thrust of the postgraduate diploma programme is to develop and broaden the academic and professional base and standing of graduates with a view to pursuing fulfilling and result-oriented careers in the field of software engineering.

The specific objectives of the programme are to:

i give opportunities for software engineering graduates that intend to make up for deficiencies in their academic background to qualify to pursue higher degrees or the practice of computing or any other related profession;

i develop software engineering graduates academically so that they can be professionally qualified and result-oriented;

i provide opportunities where candidates can acquire more expertise and techniques in the practice of computing profession; and

iv create opportunities for research and development in software engineering and provide opportunities for professionals who would like to convert their career into software engineering field.

4. PROGRAMME JUSTIFICATION

The field of Software Engineering is dynamic and always experience new inventions, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Also, the demand for Software Engineering programmes has risen in recent times due to these evolving discoveries. In view of the above considerations, the Department of Software Engineering is proposing the PGD Software Engineering programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

The criteria for admission into the postgraduate diploma in Software Engineering shall be as follows:

i Candidates with bachelor degrees from the Federal University of Technology, Akure must obtain a minimum of a Third Class degree in Software Engineering or relevant disciplines;

i Candidates with bachelor degrees from other recognized Universities must obtain a minimum of a Third Class degree in Software Engineering or relevant disciplines;

i Holders of HND in Software Engineering or other relevant disciplines from recognized Polytechnics with a minimum of lower/upper credit may also be considered for admission; and

iv Other conditions as specified by the Board of the School of Postgraduate Studies of the University.

6. PROGRAMME DURATION

The Postgraduate Diploma in Software Engineering programme is expected to run on a full-time basis for a minimum of four (4) semesters and a maximum of five (5) semesters.

7. REQUIREMENTS FOR GRADUATION

Postgraduate Diploma in Software Engineering

To be eligible for the award of the postgraduate diploma degree in Software Engineering, a candidate must have:

i. passed all the courses recommended by the Department;
ii. fulfilled all other conditions as prescribed by the Board of the School of Postgraduate Studies of the University, and
iii. successfully completed and defended a research project in an oral examination by a Panel of Examiners.
iv. passed a minimum of 60 credit units.

8. COURSE OUTLINE

FIRST YEAR

COURSE OUTLINE

PGD (SOFTWARE ENGINEERING)

FIRST YEAR, FIRST SEMESTER

Course Code	Status	Course Title	Contact Hours			Unit(s)
			L	T	P	
SEN 701	C	Basic Concepts of Software Engineering	2	0	0	3
SEN 703	C	Software Engineering Process	2	0	0	3
SEN 705	C	Software Requirements	2	0	0	3
SEN 707	C	Software Architecture and Design	1	0	3	3
SEN 709	C	Theory of Programming Languages	1	0	0	3
	Total					15
SEN 702	C	Software Quality Assurance and Testing	1	0	3	3
SEN 704	C	Software Maintenance	1	0	3	3
SEN 706	C	Object-Oriented Analysis and Design	1	0	3	3
SEN 708	C	Operating Systems	2	0	0	3
SEN 710	C	Web Application Development	2	0	0	3
	Total					15

SECOND YEAR, FIRST SEMESTER

Course Code	Status	Course Title	Contact Hours			Unit(s)
SEN 721	C	Computer Architecture and Organization	2	0	0	3
SEN 723	C	Data Structures, Algorithms and Complexity	1	0	3	3
SEN 725	C	Software Construction	1	0	3	3
SEN 727	C	Human Computer Interaction	1	0	3	3
SEN 729	C	Software Engineering Project Management	2	0	0	3
SEN 731	C	Object oriented Analysis and Design	2	0	0	3
	Total					18

	SECOND YEAR, SECOND SEMESTER					
Course Code	**Status**	**Course Title**	**Contact Hours**			**Unit(s)**
SEN 722	C	Data Communications and Networks	1	0	3	3
SEN 724	C	Distributed, Parallel and Cloud Computing	1	1	0	3
SEN 726	C	Software Modelling and Engineering Process	2	0	0	3
SEN	C	Software	1	0	3	3

728		Configuration Management				
SEN 730	C	Open Source Software Development and Application	1	0	3	3
SEN 732	C	Structured Programming	1	0	3	3
SEN 799	C	PGD Research Project	0	0	9	6
	Total					18

9. COURSE SYNOPSES

SEN 701 – Basic Concepts of Software Engineering (3 units)
Frequently asked questions about software engineering, professional and ethical responsibility; socio–technical systems – emergent system properties, systems engineering, legacy systems, critical systems – a simple safety–critical system, system availability, reliability and dependability, safety, security, software process and project management. Concept of Software Engineering: design, development and testing of software systems. Software requirements analysis, software architecture and design, implementation, integration, test planning and maintenance.

SEN 702 - Software Quality Assurance and Testing (3 units)
Software engineering culture and ethics, value and costs of quality, models and quality characteristics, software quality improvement, and software safety; Software quality management processes – software quality assurance, verification and validation, and reviews and audits; Practical considerations – software quality requirements, defect characterisation, software quality management techniques, and software quality measurement; Software quality tools. Test techniques – software engineer's intuition and experience, input domain–based techniques, code–based techniques, fault–based techniques, usage–based techniques, model–based techniques, techniques based on nature of application, and selecting and combining techniques; Test–related measures – evaluation of the program under test, and evaluation of the tests performed; Test process – practical considerations, and test activities; Software testing tools – testing tool support and categories of tools.

SEN 703 - Software Engineering Process (3 units)
Software process definition – software process management and infrastructure, Software life cycles – categories of software processes, software life cycle models, software process adaptation, practical considerations; Software process assessment and improvement – software process assessment methods, software process improvement models, and continuous and staged software process rating; Software measurement – software process and product measurement, quality of measurement results, and software process measurement techniques; Software engineering process tools.

SEN 704 – Software Maintenance (3 units)
Nature of maintenance, need for maintenance, majority of maintenance costs, evolution of software, and categories of maintenance; key issues in software maintenance – technical issues, management issues, maintenance cost estimation, and software maintenance measurement; maintenance process – maintenance processes and activities; techniques for maintenance, program comprehension, reengineering, reverse engineering, migration, and retirement; software maintenance tools

SEN 705 - Software Requirements (3 units)
Software requirement, product and process, functional and non–functional requirements, emergent properties, quantifiable requirements, system requirements; Requirements process – process models and actors, process support and management, process quality and improvement; requirements elicitation – requirements sources and elicitation techniques.

SEN 706 - Object-Oriented Analysis and Design (3 units)
Object–oriented approach to information system development, particularly in reference to the earlier stages of analysis and design. Importance of modelling, principles of modelling, object–oriented modelling, conceptual model of the Unified Modelling Language (UML), architecture, software development life cycle. The principles and basic concepts of object orientation and the different aspects of object–oriented modelling as represented by the UML technique. Case study of a typical UML–based CASE tool.

SEN 707 – Software Architecture and Design (3 units)
User interface design; Software design quality and evaluation; Software design notations – structural and behavioural descriptions; Software design strategies and methods – general strategies, functional–oriented design;

object–oriented design, data structure centred design, component–based design, and other methods; Critical systems specification – risk – driven, safety, security and software reliability specifications; Formal specification in the software process; Software design tools.

SEN 708 – Operating Systems (3 units)
Operating systems advanced concepts and structures, processes (communication and scheduling), memory management, input/output and file systems, protection and security, Concurrency, Embedded Systems. Case studies of some operating systems such as Windows and Unix operating systems.

SEN 709 - Theory of Programming Languages (3 units)
Evolution of programming languages, describing syntax and semantics, lexical and syntax analysis, names, bindings, type checking, expression and assignment statement, statement-level control structures, subprograms, abstract data types, support for object-oriented languages, concurrency, exception handling, functional and logic programming.

SEN 710 - Web Application Development (3 units)
the web environment, authoring – HTML overview, structural HTML tags, formatting text, creating links, adding images and other page elements, tables, frames, forms, specifying colour in HTML, cascading style sheets, server side include; graphics – GIF, JPEG, PNG formats, designing graphics with palette, animated GIFs, multimedia and interactivity, introduction to JavaScript, DHTM, XML, XHTML, WAP and WML.

SEN 721 - Computer Architecture and Organization (3 units)
Computer architecture and organisation, basic structure of computers; performance evaluation: metrics and calculations, performance equations, Amdahl's law; instruction set architecture; introduction to computer arithmetic; software, CPU design and architecture, basic CPU organisation; pipelining and instruction level parallelism; the memory subsystems – memory hierarchy, caches and cache hierarchies, cache organisations, cache performance, compiler support for cache performance, main memory organisation, virtual memory, I/O organisations; introduction to embedded systems; parallel processing, multiprocessor and thread-level parallelism; interconnection networks and clusters, vector processing, multiprocessing.

SEN 722 - Data Communications and Networks (3 units)
Digital and analogue representations and channels; bandwidth and noise; channel capacity; telecommunication history; switching, circuit–switched networks, datagram networks, concept of virtual circuit networks, structure of circuit and packet switch. uses of computer networks, network hardware and software, reference models, example networks, network standardisation; physical layer – the theoretical basis for data communication, transmission media, digital modulation and multiplexing; data link layer – data link layer design issues, error correction and control, elementary data link and sliding window protocols, medium access control sublayer, data link layer switching; the network layer in the internet; the transport layer – transport services, network security; introduction to software defined networks and sensor networks.

SEN 723 - Data Structures, Algorithms and Complexity (3 units)
Stacks, linked lists; trees, priority queues; search trees; sorting; hashing, garbage collection; storage management; maps and dictionaries; text processing; graphs, generic programming: coding for re–use of both data structures and algorithms. Introduction to algorithms and its importance, mathematical foundations: growth functions, complexity analysis of algorithms, summations, recurrences, sorting algorithms; algorithm design: divide-and-conquer approach, greedy approach. Graph algorithms: graph searching, topological sort, minimum spanning tree, shortest paths, backtracking and its applications in games; string matching; dynamic programming and longest common subsequence; theory of NP–completeness; turing machines and the halting problem; introduction to computational complexity; introduction to algorithm for parallel computers, parallelism.

SEN 724 – Distributed, Parallel and Cloud Computing (3 units)
Analysis and Design of Parallel and Distributed Algorithms; Languages/Operating Systems for parallel processing; GPGPU computing; Architecture of parallel/distributed systems, Tools for parallel computing, Parallel (distributed) database systems, Networking aspects of parallel/distributed computing, Parallel/distributed scientific computing Applications; High- performance computing Applications in molecular sciences; Multimedia applications for parallel/distributed systems; Grid networks, services and applications; Distributed File Systems; Hyper Scale/Hyper Converged Distributed Storage Design, Storage I/O

Protocols; Cloud as a Service, Cloud Infrastructure, Management and operations, Performance, Scalability, Reliability, Virtualization, loud Provisioning Orchestration, Architecture support, Development Tools, Platforms and Applications, Legal aspects and Service Level Agreement, Mobile computing advances in the Cloud, Performance Optimization

SEN 725 – Software Construction (3 units)
Construction technologies – API design and use, object–oriented runtime issues, parameterisation and generics, assertions, design by contract, and defensive programming, error handling, exception handling and fault tolerance, executable models, state–based and table–driven construction techniques, runtime configuration and internationalisation, grammar–based input processing, concurrency primitives, middleware, construction methods for distributive software, constructing heterogeneous systems, performance analysis and tuning, platform standards, and test–first programming; Software construction tools – development environments, GUI builders, unit testing tools, and profiling, performance analysis and slicing tools.

SEN 726 - Software Modelling and Engineering Process (3 units)
The theory of modelling language design; UML modelling language; Approaches to model transformations and automated code generation; Model analyses methods; Basics of software engineering modelling tools; Key elements of software engineering methodologies; Industrial application of software engineering (experience and issues); System and multi–model development; Architectural design software engineering; Relevant research areas and directions; software engineering process models (e.g., agile modelling).

SEN 727 – Human Computer Interaction (3 units)
Human factors of interactive software; theories; principles and guidelines of human computer interaction design including command line interface, graphical user interface and application programmatic interface; event-driven application design and development; direct manipulation; interaction devices; system and feedback messages, gesture recognition system, computer supported cooperative work, virtual reality, augmented reality, multimedia system, robotic etc.

SEN 728 – Software Configuration Management (3 units)
Management of the software configuration management process – organisation context for software configuration management, constraints and guidance for software configuration management process, planning for software configuration management, software configuration management plan, and surveillance of software configuration management; Software configuration identification and software library; Software configuration control – requesting, evaluating and approving software changes, implementing software changes, and deviations and waivers; Software configuration status accounting – software configuration status information and reporting; Software configuration; Software release management and delivery – software building, and software release management; Software configuration management tools.

SEN 729 - Software Engineering Project Management (3 units)
Determination and negotiation of requirements, feasibility analysis, and process for the review and revision of requirements; Software project planning – process planning, determine deliverables, effort, schedule and cost estimation, resource allocation, risk management, quality management, and plan management; Software project enactment – implementation of plans, software acquisition and supplier contract management, implementation of measurement process, monitor process, control process, and reporting; Review and evaluation – determining satisfaction of requirements, and reviewing and evaluating performance; closure – determining closure and closure activities; Software engineering measurement – establish and sustain measurement commitment, plan the measurement process, perform the measurement process; and evaluate measurement; Software engineering management tools.

SEN 730 – Open-Source Software Development and Application (3 units)
Concepts, principles and applications of open-source software. Discusses about open-source software development process, Covers economy, business, societal and intellectual property aspects of open-source software. Obtain hands-on experience on open-source software and related tools through developing various open-source software applications such as mobile applications and web applications building on existing open-source frameworks and application development platforms.

SEN 731 - Object oriented Analysis and Design (3 units)
Object–oriented approach to information system development, particularly in reference to the earlier stages of analysis and design. Importance of modelling, principles of modelling, object–oriented modelling, conceptual model of the Unified Modelling Language (UML), architecture, software development life cycle. The principles and basic concepts of object orientation and the different aspects of object–oriented modelling as represented by the UML technique. Case study of a typical UML–based CASE tool.

SEN 732 – Structured Programming (3 units)
Structured programming concepts and structures; introduction to Perl programming language – introduction, scalar data, lists and arrays, subroutines, hashes, I/O basics, concepts of regular expressions, using regular expressions, more control structures, modules and objects, standard
modules, file handles and file tests, directory operations, manipulating files and directories, string and sorting. Perl as technology – Unicode, inter-process communication, thread, internals and externals; databases and Perl, XML and SOAP, networking programming – sockets, email connectivity, FTP, LDAP; Perl/Tck; win32 modules and extensions, OLE automation, ODBC extension for win32, CGI and web server programming.

SEN 799 – PGD Research Project (6 units)
An independent or group investigation of appropriate software, hardware, communication and networks or IT related problems in Software Engineering carried out under the supervision of a lecturer. Before registering, the student must submit a written proposal to the supervisor to review. The proposal should give a brief outline of the project, estimated schedule of completion, and computer resources needed. A formal written report is essential and an oral presentation may also be required.

CURRICULUM FOR MASTER OF TECHNOLOGY M.TECH. PROGRAMME IN SOFTWARE ENGINEERING

1. PROGRAMME OFFERED: Masters of Technology (M.Tech.) in Software Engineering

2. PROGRAMME PHILOSOPHY

The last twenty years or so has seen a dramatic growth in the demand for professionals trained in Software Engineering. This growth was partly driven by tremendous technological advances, such as the Internet, the world–wide–web, and their applications. But the growth in demand was also driven by a much greater realization on the part of many organizations and individuals of the importance of software for their well–being, and the more widespread use of these technologies by individuals whose primary area of expertise was not in software engineering. With the emergence of technologies such as web, blockchain and AI, employers started to demand emerging skills to power these technologies. In the present age, there is a need for programme that will equip graduates with the software technologies that organizations needed to power their their software engineering infrastructures, or the web development skills required to take advantage of the many opportunities opened up by the Internet.

The M. Tech. software engineering will provide sufficient understanding of organizational processes to be able to develop software applications. The programme is designed to provide students with necessary tools and techniques for software engineering. The curriculum emphasizes the art, science, engineering and technology of computing will comprise mainly course work and research activities in software engineering. In the first year of the programme, which consists of two semesters, students will be required to successfully complete the compulsory and/or elective courses in the programme to be eligible to start their theses in the first semester of the second year. Each course will be assessed based on a written Continuous Assessment (CA) and a final examination at the end of the semester. Research for the M. Tech. degree programme will be independently carried out by the candidates under the supervision of members of staff of the Department. The programme is designed to extend frontiers of knowledge and making meaningful contributions to knowledge, particularly in software engineering and computer science, which are areas of intense research and applications activities worldwide. Through the M. Tech programme, much needed research and leadership personnel for academics, institutions, government and

industries will be produced for national and international deployment.

3. **PROGRAMME OBJECTIVES**

The specific objectives of the programmes are to:

i. Expose candidates to current researches and methodological models particularly in software engineering and related fields;
ii. provide and promote sound practical and theoretical training in computer hardware, software and application areas, that will make the students useful in both private and public sectors of the economy;
iii. enable candidates to identify computing and software engineering related problems and proffer recommendations and strategies for their solutions; and inculcate in candidates the mastery of appropriate skills to articulate a critical analysis of advanced studies in software engineering and information technology

4. PROGRAMME JUSTIFICATION

The field of Software Engineering is dynamic and always experience new technologies, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Moreover, the demand for Software Engineers has risen in recent times due to these evolving discoveries. In view of the above considerations, the Department of Software Engineering is proposing the M.Tech. Software Engineering programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

To be eligible for admission, candidates must possess any one of the following:

i. B. Tech. in Software Engineering or any other computing related discipline from the Federal University of Technology, Akure, Nigeria with at least a Second Class Honours (Lower Division), or
ii. B. Tech. or B.Sc. in Software Engineering or any other computing related discipline from other reputable institutions with at least a Second Class Honours (Lower Division), or
iii. Postgraduate Diploma in Software Engineering or any other computing related discipline from the Federal University of Technology, Akure, Nigeria or other reputable institutions with a CGPA of not less than 3.5 on a 5-point (3.0 on a 4-point) credit scale or a minimum score of 60%.

6. PROGRAMME DURATION

The duration of the M. Tech. programme shall be a minimum of 18 months and maximum of 24 months on a full-time basis.

7. GRADUATION REQUIREMENTS

To be eligible for the award of the M. Tech. degree in Software Engineering, a candidate must have:

i. passed all core courses and successfully completed the project work;
   passed a minimum of 48 credit units, made up as follows:
   a. 36 credit units in core courses;
   b. 12 credit units in research thesis; and
ii. successfully presented at least two seminars: proposal and progress seminars;
iii. successfully completed and defended a research thesis in an oral examination by a Panel of Examiners.
iv. fulfilled other requirements from PG School
v. must submit the required number of copies of dissertation; .

8. COURSE OUTLINE

M. TECH. (SOFTWARE ENGINEERING)

	FIRST YEAR, FIRST SEMESTER					
Course Code	**Status**	**Course Title**	**Contact Hours**			**Unit(s)**
SEN 801	C	Special Topics in Software Engineering	3	0	0	3
SEN 803	C	Advanced Software Requirements	3	0	0	3
SEN 805	C	Advanced Software Design and Modelling	3	0	3	3
SEN 807	C	Advanced Software Testing and Quality Assurance	3	0	3	3
SEN 809	C	Software Engineering Process and Configuration	3	0	0	3
SEN 811	C	Artificial Intelligence and Expert System	3	0	0	3
SEN 813	C	Software Engineering Law and Legal Practice	3	0	0	3
	Total					21

	FIRST YEAR, SECOND SEMESTER					
Course Code		**Course Title**	**Contact Hours**			**Unit(s)**
SEN 802	C	Research Methodology	3	0	0	3
SEN 804	C	Software Engineering Project Management	3	0	0	3
SEN 806	C	Advanced Software Maintenance and Evolution	3	0	0	3
SEN 808	C	Advanced Software Engineering Business and Economics	3	0	0	3
SEN 810	C	Intelligent Agents	3	0	0	3
SEN 812	C	Formal methods in Software Engineering	3	0	0	3
SEN 814	C	Software and Systems Security	3	0	0	3
	Total					21

Not less than fifteen (15) course units shall be mounted in each semester.

	SECOND YEAR					
Course Code	**Status**	**Course Title**	**Contact Hours**			**Unit(s)**
SEN889	C	Master's Thesis research Project	0	0	36	12

9. COURSE SYNOPSES

SEN 801 - Special Topics in Software Engineering (3 units)
Review of publications on the recent developments in Software Engineering. Experts and professionals in the industries and government establishments shall be invited to address students on their experience. The course shall provide a platform for students to have direct interactions with the captains of Software Engineering in both public and private sectors of Nigeria. Some selected Nigerian in Diaspora shall be invited to address the students on their overseas experience. The students are given the opportunity to familiarize themselves with career structure and needs of the society. The platform provides the basis for the students to have insight into a new mindset for Software Engineering as an emergent and evolutionary platform for job and wealth creation. Recent topics and developments in software engineering are expected to be introduced from year to year. Apart from seminars to be delivered by lecturers or guests, students are expected to do substantial readings on their own.

SEN 802 - Research Methodology (3 units)
Foundations of research; problem identification and formulation; research design; qualitative and quantitative research; measurement; sampling; data analysis; Interpretation of data and paper writing; use of encyclopaedias, research guides, handbook etc., academic databases for computer science discipline; use of tools/techniques for research: reference management software, software for detection of plagiarism.

SEN 803 - Advanced Software Requirements (3 units)
Requirements analysis – requirements classification, conceptual modelling, architectural design and requirements allocation, requirements negotiation and formal analysis; Requirements specification–system definition document and system requirements specification; requirements validation – requirements review, prototyping, model validation and acceptance tests; practical consideration – iterative nature of requirements process, change management, requirements attributes, requirements tracing and measuring requirements; software requirement tools.

SEN 804 - Software Engineering Project Management (3 units)
Determination and negotiation of requirements, feasibility analysis, and process for the review and revision of requirements; Software project planning – process planning, determine deliverables, effort, schedule and cost estimation, resource allocation, risk management, quality management, and plan management; Software project enactment – implementation of plans, software acquisition and supplier contract management, implementation of measurement process, monitor process, control process, and reporting; Review and evaluation – determining satisfaction of requirements, and reviewing and evaluating performance; closure – determining closure and closure activities; Software engineering measurement – establish and sustain measurement commitment, plan the measurement process, perform the measurement process; and evaluate measurement; Software engineering management tools.

SEN 805 - Advanced Software Design and Modelling (3 units)
Context of software design, software design process, software principles; key issues in software design –

concurrency, control and handling of events, data persistence, distribution of components, error and exception handling and fault tolerance, interaction and presentation, and security; software structure and architecture – architectural structures and viewpoints, architectural styles, design patterns, architecture design decisions, and families of programs and frameworks. The theory of modelling language design; UML modelling language; Approaches to model transformations and automated code generation; Model analyses methods; Basics of software engineering modelling tools; Key elements of software engineering methodologies; Industrial application of software engineering (experience and issues); System and multi–model development; Architectural design software engineering; Relevant research areas and directions; software engineering process models (e.g., agile modelling).

SEN 806 - Advanced Software Maintenance and Evolution (3 units)

Nature of maintenance, need for maintenance, majority of maintenance costs, evolution of software, and categories of maintenance; key issues in software maintenance – technical issues, management issues, maintenance cost estimation, and software maintenance measurement; maintenance process – maintenance processes and activities; techniques for maintenance, software evolution, program comprehension, reengineering, reverse engineering, migration, and retirement; software maintenance tools.

SEN 807 - Advanced Software Testing and Quality Assurance (3 units)

Value and costs of quality, models and quality characteristics, software quality improvement, and software safety; Software quality management processes – software quality assurance, verification and validation, and reviews and audits; Practical considerations – software quality requirements, defect characterisation, software quality management techniques, and software quality measurement; Software quality tools. Testing versus correctness proofs and formal verification, testing versus debugging, testing versus programming); Test levels – the target of the test, and objectives of testing; Test techniques – software engineer's intuition and experience, input domain–based techniques, code–based techniques, fault–based techniques, usage–based techniques, model–based techniques, techniques based on nature of application, and selecting and combining techniques; Test–related measures – evaluation of the program under test, and evaluation of the tests performed; Test process – practical considerations, and test activities; Software testing tools – testing tool support and categories of tools

SEN 808 - Advanced Software Engineering Business and Economics (3 units)

Software engineering business and economic fundamentals; lifecycle economics; Risk and uncertainty – goals, estimates and plans, estimation techniques, addressing uncertainty, prioritisation, decisions under risk and uncertainty; Economic analysis methods – for–profit decision analysis, minimum acceptable rate of return, return on investment and capital employed, cost–benefit analysis, cost–effectiveness analysis, break–even analysis, business case, multiple attribute evaluation, and optimisation analysis; Practical considerations – the "good enough" principle, friction – free economy, ecosystems, and off-shoring and out-sourcing.

SEN 809 - Software Engineering Process and Configuration (3 units)

Advanced software configuration management, constraints and guidance for software configuration management process, planning for software configuration management, software configuration management plan, and surveillance of software configuration management; Software configuration identification and software library; Software configuration control – requesting, evaluating and approving software changes, implementing software changes, and deviations and waivers; Software configuration status accounting – software configuration status information and reporting; Software configuration; Software release management and delivery – software building, and software release management; Software configuration management tools.

SEN 810 – Intelligent Systems (3 units)

Introduction and basic concepts for DAI (distributed artificial intelligence). Coordination methods general models, joint coordination techniques, organizational structures, information exchange on the metalevel, multi-agent planning, explicit analysis and synchronisation. Negotiation methods: principles, protocols, production sequencing as negotiations, conventions for automatic negotiations. Interoperability: Methods for interoperation of software, speech acts, KQML, FIPA. Multi-agent architectures: Low-level architectural support, DAI-testbeds, agent oriented software development. Agent theory: Fundamentals of modal logic, the BDI architecture. Agent architectures: deliberative, reactive and hybrid architectures. Mobile

agents: requirements, implementation, safety for mobile agents, environments for mobile agents. Agent typology and technical questions. Applications. Practical part of the course that contains exercises and a project that includes implementation of a multi-agent system.

SEN 811 - Artificial Intelligence and Expert System (3 units)

General problem solving approaches in artificial intelligence, characteristic requirements for the realisation of intelligent systems, programming languages for artificial intelligence and architecture for artificial intelligence machines; the psychological perspective of cognition; production systems; problem solving by intelligent search; the logic proposition and predicates; default and non-monotonic reasoning; structural approach to knowledge representation, the nature and goals of soft-computing, basic forms of inference; the representation and manipulation of knowledge in a computer; rule-based representations; logic-based representations; frames; semantic and partitioned nets; generation of explanations; handling of uncertainties; truth maintenance systems; expert system architectures; an analysis of some classic expert systems; building expert systems; methodologies for building expert systems: knowledge acquisition and elicitation, formalisation, representation and evaluation; knowledge engineering tools; expert systems paradigms.

SEN 812 - Formal methods in Software Engineering (3 units)

Modelling principles, properties and expression of models, syntax, semantic and pragmatics, and preconditions, post–conditions, and invariants; Analysis of models – analyzing for completeness, consistency and correctness, traceability and interaction analysis; Software engineering methods – heuristic methods, formal methods, prototyping methods and agile methods.

SEN 813 - Software Engineering Law and Legal Practice (3 units)

The legal aspects of software engineering, particularly intellectual property law, as well as ethical issues related to software development in ICT industry. It is intended to provide students with a solid foundation on legal matters that impact software development, including patents, trademarks, copyright, trade secrets, privacy and confidentiality, contracts and licensing, government regulations, global legal issues including Internet law and cybercrime, professional ethics and code of conduct. Basic concepts of jurisprudence, speech anonymity versus accountability, ethical decision making in the network environment. Students shall learn about the legal and ethical issues they need to be aware of in developing and managing new media and informatics technology and products so that they can work effectively with legal counsel and other professional. Accreditation, certification and licensing, codes of ethics and professional conduct, nature and role of professional societies and software engineering standards, economic impact of software, employment contracts, legal issues, documentation, and trade–off analysis; Group dynamics and psychology – dynamics of working in teams/groups, individual cognition, dealing with problem complexity, interacting with stakeholders, dealing with uncertainty and ambiguity, and dealing with multicultural environments; Communication skills – reading, understanding and summarising, writing, teams and group communication, and presentation skills.

SEN 814 - Software and Systems Security (3 units)

Security mindset, design principles, system/security life–cycle, security implementation mechanisms, information assurance analysis model, disaster recovery, and forensics; Security mechanisms–cryptography, authentication, redundancy, and intrusion detection; Operational issues–trends, auditing, cost/benefit analysis, asset management, standards, enforcement, legal issues, and disaster recovery; Policy–creation of policies, maintenance of policies, prevention, avoidance, incident response (forensics), and domain integration (physical, network, internet, etc.); Attacks – social engineering, denial of service, protocol attacks, active and passive attacks, buffer overflow attacks, and malware; Security domains–security awareness and possible domains; Forensics–legal systems, digital forensics and its relationship to other forensic disciplines, rules of evidence, search and seizure, digital evidence, and media analysis; Security services; Threat analysis model; Vulnerabilities.

SEN 889 - Master's Thesis research Project (12 units)

An independent or group investigation of appropriate software, hardware, communication and networks or IT related problems in Software Engineering carried out under the supervision of a lecturer. Each candidate is required to prepare a thesis, which represents the report of the study, in an effectively organized and well written form. The candidate is required to present at least two seminar papers before the final oral presentation. The thesis is examined according to the university regulations. The following are some of the major areas of research for which the facilities available to students and staff of the Department can support: soft computing, intelligent systems, computer and information systems, web applications, distributed systems, expert systems,

system securities, modelling and simulations, games applications, multi-media systems, big data analytics, data mining and warehousing and system networking. Candidates applying for M. Tech.. in Software Engineering programme are strongly advised to consider these areas.

SEN 899 - M. Phil. Research Project (12 units)
An independent investigation of an appropriate software engineering research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) for review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organized and well-written form. The candidate is required to present at least two seminar papers before the final oral presentation. The thesis is examined based on the University regulations.

CURRICULUM FOR MASTER OF PHILOSOPHY PROGRAMME IN SOFTWARE ENGINEERING

1. PROGRAMME OFFERED: Masters of Philosophy (M.Phil) in Software Engineering

2. PROGRAMME PHILOSOPHY
The last twenty years or so has seen a dramatic growth in the demand for professionals trained in Software Engineering. This growth was partly driven by tremendous technological advances, such as the Internet, the world–wide–web, and their applications. But the growth in demand was also driven by a much greater realization on the part of many organizations and individuals of the importance of software for their well–being, and the more widespread use of these technologies by individuals whose primary area of expertise was not in software engineering. With the emergence of technologies such as web, blockchain and AI, employers started to demand emerging skills to power these technologies. In the present age, there is a need for programme that will equip graduates with the software technologies that organizations needed to power their their information technology infrastructures, or the web development skills required to take advantage of the many opportunities opened up by the Internet.

The M. phil. software engineering will provide sufficient understanding of organizational processes to be able to develop software applications. The programme is designed to provide students with necessary tools and techniques for software engineering. The curriculum emphasizes the art, science, engineering and technology of computing will comprise mainly course work and research activities in software engineering. In the first year of the programme, which consists of two semesters, students will be required to successfully complete the compulsory and/or elective courses in the programme to be eligible to start their theses in the first semester of the second year. Each course will be assessed based on a written Continuous Assessment (CA) and a final examination at the end of the semester. Research for the M. Tech. degree programme will be independently carried out by the candidates under the supervision of members of staff of the Department. The programme is designed to extend frontiers of knowledge and making meaningful contributions to knowledge, particularly in software engineering, science and information technology, which are areas of intense research and applications activities worldwide. The programme will produce professionals that are equipped to develop intelligent local content system solutions to solve the immediate problems in our environment.

4. PROGRAMME OBJECTIVES
The specific objectives of the programmes are to:

1. expose candidates to current researches and methodological models particularly in software engineering and related fields;
2. expose candidates to the relevant fields of science and information technology for intense researches and applications;
3. provide and promote sound practical and theoretical training in computer hardware, software and application areas, that will make the students useful in both private and public sectors of the economy;
4. enable candidates to identify computing and software engineering related problems and proffer recommendations and strategies for their solutions; and
5. inculcate in candidates the mastery of appropriate skills to articulate a critical analysis of advanced studies in software engineering and information technology.

5. PROGRAMME JUSTIFICATION

The field of Software Engineering is dynamic and always experience new technologies, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Moreover, the demand for Software Engineers has risen in recent times due to these evolving discoveries. In view of the above considerations, the Department of Software Engineering is proposing the M.phil. Software Engineering programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

To be eligible for admission, candidates must possess any one of the following:

The requirements for admission into the M. Phil degree programme consist of:

i. M. Tech. in Software Engineering from Federal University of Technology, Akure, Nigeria with a CGPA of not less than 3.0 on a 5-point credit scale or a minimum overall score of 55%, or
ii. M. Tech. or M.Sc. in Software Engineering from other institutions with a CGPA of not less than 3.0 on a 5 point credit scale or a minimum overall score of 60%.
Iii. All applications for the M.Phil. programme shall be subjected to other School of Postgraduate Studies' regulations and departmental carrying capacity.

6. PROGRAMME DURATION

The duration of the M. Phil. programme shall be a minimum of 18 months and maximum of 24 months on a full-time basis.

7. GRADUATION REQUIREMENTS

To be eligible for the award of M. Phil. Degree in Software Engineering, a candidate must have:

i. passed all core courses and successfully completed the project work;
   passed a minimum of 48 credit units, made up as follows:
   a. 36 credit units in core courses;
   b. 12 credit units in research thesis; and

ii. successfully presented at least two seminars: proposal and progress seminars;
iii. successfully completed and defended a research thesis in an oral examination by a Panel of Examiners.
iv. fulfilled other requirements from PG School
v. must submit the required number of copies of dissertation; .

8. COURSE OUTLINE9. COURSE OUTLINES

FIRST SEMESTER

MPHIL. (SOFTWARE ENGINEERING)

	M. PHIL. FIRST SEMESTER					
Course Code	**Status**	**Course Title**	**L**	**T**	**P**	**Unit(s)**
SEN 881	C	Special Topics in Software Engineering	3	0	0	3
SEN 883	C	Research Methodology	3	0	0	3
		Elective	3	0	0	3
		Total				9
		Electives				
SEN 885	E	Embedded Systems	3	0	0	3
SEN 887	E	Open Source Software	3	0	0	3
SEN 891	E	Artificial Intelligence and Expert System	3	0	0	3
SEN 893	E	Big Data Analytics	3	0	0	3

Candidates are expected to take at least three courses each semester from the available list of courses. However, Special Topics in Software Engineering and Research Methodology courses are compulsory.

	M. PHIL. SECOND SEMESTER					
Course Code	**Status**	**Course Title**	**L**	**T**	**P**	**Unit (s)**
SEN 882	C	Software Engineering Modelling and Analysis	3	0	0	3
SEN 884	C	Emerging Trends in Software Engineering	3	0	0	3
		Elective	3	0	0	3
		Total				9
		Electives				
SEN 886	E	Software Engineering Business	3	0	0	3
SEN 888	E	Group Dynamics and Communications	3	0	0	3
SEN	E	Formal Methods of	3	0	0	3

890		Software Engineering				
SEN 892	E	Software Performance Evaluation and Benchmarking	3	0	0	3
SEN 894	E	Game Design and Development	3	0	0	3

THIRD SEMESTER

Course Code	Status	Course Title	Contact Hours			Unit
			L	T	P	
SEN 899	C	Individual Research Thesis		0	36	12
		Total				12

9. COURSE SYNOPSES

SEN 881 – Special Topics in Software Engineering (3 units)
Review of publications on the recent developments in Software Engineering. Experts and professionals in the industries and government establishments shall be invited to address students on their experience. The course shall provide a platform for students to have direct interactions with the captains of Software Engineering in both public and private sectors of Nigeria. Some selected Nigerian in Diaspora shall be invited to address the students on their overseas experience. The students are given the opportunity to familiarize themselves with career structure and needs of the society. The platform provides the basis for the students to have insight into a new mindset for Software Engineering as an emergent and evolutionary platform for job and wealth creation. Recent topics and developments in software engineering are expected to be introduced from year to year. Apart from seminars to be delivered by lecturers or guests, students are expected to do substantial readings on their own.

SEN 882 - Software Engineering Modelling and Analysis (3 units)
UML modeling language; Approaches to model transformations and automated code generation; Model analyses methods; Basics of software engineering modeling tools; Key elements of software engineering methodologies; Industrial application of software engineering (experience and issues); System and multi–model development; Architectural design software engineering; Relevant research areas and directions; software engineering process models

SEN 883 - Research Methodology (3 units)
Research problem identification and formulation; research design; qualitative and quantitative research; measurement; sampling; data analysis; Interpretation of data and paper writing; use of encyclopedias, research guides, handbook etc., academic databases for computer science discipline; use of tools/techniques for research: reference management software, software for detection of plagiarism

SEN 884 – Emerging Trends in Software Engineering (3 units)
Security concepts, biometrics security, security risk management, design for security, system survivability, service–oriented software engineering – services as reusable components, service engineering, software development with services, aspect – oriented software development – the separation of concerns, aspects, joint points and point-cuts, software engineering with aspects

SEN 885 – Embedded Systems (3 units)
Typical embedded systems–core of the embedded system, memory, communication interface; embedded firmware; embedded real–time operating systems; real–time operating systems–based embedded system design; task communications and synchronisation

SEN 886 – Software Engineering Business (3 units)
Software proposal writing, accreditation, certification and licensing, codes of ethics, costing, marketing and professional conduct, nature and role of professional societies and software engineering standards, economic impact of software, employment contracts, legal issues, documentation, and trade–off analysis.

SEN 887 – Open Source Software (3 units)
Advanced open-source software development process, Covers economy, business, societal and intellectual property aspects of open source software. Obtain hands-on experience on open source software and related tools through developing various open source software applications such as mobile applications and web applications building on existing open-source frameworks and application development platforms.

SEN 888 - Group Dynamics and Communications (3 units)
Group dynamics and psychology – dynamics of working in teams/groups, individual cognition, dealing with problem complexity, interacting with stakeholders,

dealing with uncertainty and ambiguity, and dealing with multicultural environments; Communication skills – reading, understanding and summarising, writing, teams and group communication, and presentation skills.

SEN 891 - Artificial Intelligence and Expert System (3 units)
General problem solving approaches in artificial intelligence, characteristic requirements for the realization of intelligent systems, programming languages for artificial intelligence and architecture for artificial intelligence machines; the psychological perspective of cognition; production systems; problem solving by intelligent search; the logic proposition and predicates; default and non-monotonic reasoning; structural approach to knowledge representation, the nature and goals of soft-computing, basic forms of inference; the representation and manipulation of knowledge in a computer; rule-based representations; logic-based representations; frames; semantic and partitioned nets; generation of explanations; handling of uncertainties; truth maintenance systems; expert system architectures; an analysis of some classic expert systems; building expert systems; methodologies for building expert systems: knowledge acquisition and elicitation, formalization, representation and evaluation; knowledge engineering tools; expert systems paradigms.

SEN 890 - Formal Methods of Software Engineering (3 units)
Advanced modelling principles, properties and expression of models, syntax, semantic and pragmatics, and preconditions, post–conditions, and invariants; Analysis of models – analyzing for completeness, consistency and correctness, traceability and interaction analysis; advanced software engineering methods – heuristic methods, formal methods, prototyping methods and agile methods.

SEN 893 - Big Data Analytics (3 units)
Nosql movement; the theory and techniques for data acquisition, cleansing, and aggregation; the principles and functionalities of big data programming models and tools; acquiring, processing, and managing large heterogeneous data collections; algorithms and systems for information and knowledge extraction from large data Collections.

SEN 892 – Software Performance Evaluation and Benchmarking (3 units)
Software performance modeling; performance measurement techniques – on-chip performance monitoring, off-chip hardware monitoring, software monitoring, micro-coded instruction,, aggregating performance metrics over a benchmark suite, statistical techniques for computer performance analysis, statistical sampling for processor and cache simulation, statistical simulation, benchmark simulation and introduction to analytical models; energy and power simulator, validation

SEN 894 - Game Design and Development (3 units)
Platforms, goals and genres, player elements, story and character development, game play, levels, interface, audio, development team roles, game development process, and marketing and maintenance. Students will play games analyze them, and complete portions of game designs with appropriate documentation

SEN 899 - M. Phil. Research Project (12 units)
An independent investigation of an appropriate software engineering research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) for review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organized and well-written form. The candidate is required to present at least two seminar papers before the final oral presentation. The thesis is examined based on the University regulations.

CURRICULUM FOR MASTER OF PHILOSOPHY/DOCTOR OF PHILOSOPHY (M. PHIL/PHD) PROGRAMME IN SOFTWARE ENGINEERING

1. PROGRAMME OFFERED: Master of Philosophy/ Ph.D. Programme in Software Engineering

2. PROGRAMME PHILOSOPHY

The M.Phil./Ph.D. in Software Engineering programme will provide sufficient understanding of organisational processes to be able to support Information Technology

applications from a user or organisational perspective. The programme is designed to provide students with necessary tools for software design and implementation techniques and logical reasoning. The curriculum emphasizes the art, science, engineering and technology of software. Students are developed to solve the challenges as professional software Engineers in private and public organizations, industries, higher institutions of learning, government corporations and so on. The programme will produce professionals that are equipped to develop intelligent local content system solutions to solve the immediate problems in our environment.

3. PROGRAMME OBJECTIVES

The major aim of the Mphil/PhD in software engineering programme is to provide an enabling platform to educate highly qualified researchers required for the expansion of fundamental knowledge and technological innovation through research and development, as well as the needs of institutions of higher learning. The specific objectives of the programme are to:

i. inspire candidates to know the current research fields and the relevant models in the field of software engineering and other computing fields;
ii. inspire candidates to conduct intense researches in the field of science and information technology with a view to provide software solutions to some societal problems;
iii. train candidates to cultivate wide-ranging hands-on and hypothetical knowledge in high-performance computing and application areas for the overall gain of the private and public sectors of the economy;
iv. train candidates on how to determine related problems and adopting computing-based methods to proffer solutions; and
v. train candidates to master relevant skills for thorough and detailed analysis of advanced studies in relevant domain of knowledge.

4. PROGRAMME JUSTIFICATION

The field of Software Engineering is dynamic and always experience new inventions, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Also, the demand for Software Engineering programmes has risen in recent times due to these evolving discoveries. In view of the above considerations, the Department of Software Engineering is proposing the PGD Software Engineering programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

The requirements for admission into the M.Phil./PhD programme shall consist of:

(i) M. Tech in Software Engineering or other related discipline from the Federal University of Technology. Akure, Nigeria with a CGPA of not less than 3.0 on a 5-point credit scale, or
(ii) M. Tech. or M. Sc. in Software Engineering or other related discipline from other reputable institutions with a CGPA of not less than 3.5 on a 5-point (3.0 on a 4-point) credit scale or a minimum overall score of 60%, or
(iii) M. Phil. in Software Engineering from the Federal University of Technology, Akure, Nigeria or other a recognized/reputable universities with a CGPA of not less than 3.5 on a 5-point (3.0 on a 4-point) credit scale or a minimum overall score of 60%.
(iv) All applications for the M.Phil./PhD programme shall be subjected to the School of Postgraduate Studies regulations.

6. PROGRAMME DURATION

The M.Phil./PhD in Software Engineering programme is expected to last for a minimum of 18 months and a maximum of 24 months.

7. GRADUATION REQUIREMENTS

For students admitted through Master of Philosophy/PhD programme in Software Engineering, to be eligible for the award of PHD in Software Engineering, a candidate must have:

a. passed a total of 12 course units and 6 research units in two semesters;
b. passed all the courses recommended by the Department;
c. successfully presented at least two seminars – proposal and progress seminars;
d. successfully completed and defended a research thesis in an oral examination;
e. fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University.

8. REQUIREMENT FOR TRANSFER TO PHD PROGRAMME IN SOFTWARE ENGINEERING

A student who enters the M.Phil./Ph. D. degree programme may be allowed to transfer to the Ph.D. programme if he/she makes a satisfactory progress in

his/her study. Such a candidate will be expected to fulfil the following requirements:

(i) completed all course work with a CGPA of not less than 3.5
(ii) successfully presented at least two seminars; proposal and progress seminars,
(iii) prepares and submits to the School of Postgraduate Studies through the Department, a research plan considered suitable for pursuing a Ph.D. degree;
(iv) presents a detailed report of research work done up to the time of seeking transfer and submit to the School of Postgraduate Studies any relevant published and unpublished materials (if any) that can be assessed by the Department;
(v) passes an oral transfer examination to be conducted by the School of Postgraduate Studies with the panel of examiners drawn from his/her department on the subject of the research and topics related to the field of study; and
(vi) candidate fulfils all other conditions as prescribed by the Board of School of Postgraduate Studies of the University.

9. COURSE OUTLINES

FIRST SEMESTER

MPHIL. (SOFTWARE ENGINEERING)

	M. PHIL. FIRST SEMESTER					
Course Code	**Status**	**Course Title**	**L**	**T**	**P**	**Unit(s)**
SEN881	C	Special Topics in Software Engineering	3	0	0	3
SEN883	C	Research Methodology	3	0	0	3
		Elective	3	0	0	3
		Total				9

		Electives				
SEN885	E	Embedded Systems	3	0	0	3
SEN887	E	Open Source Software	3	0	0	3
SEN891	E	Artificial Intelligence and Expert System	3	0	0	3
SEN893	E	Big Data Analytics	3	0	0	3

Candidates are expected to take at least three courses each semester from the available list of courses. However, Special Topics in Software Engineering and Research Methodology courses are compulsory.

	M. PHIL. SECOND SEMESTER					
Course Code	**Status**	**Course Title**	**L**	**T**	**P**	**Unit(s)**
SEN882	C	Software Engineering Modelling and Analysis	3	0	0	3
SEN884	C	Emerging Trends in Software Engineering	3	0	0	3
		Elective	3	0	0	3
		Total				9

		Electives				
SEN886	E	Software Engineering Business	3	0	0	3
SEN888	E	Group Dynamics and Communications	3	0	0	3
SEN890	E	Formal Methods of Software Engineering	3	0	0	3
SEN892	E	Software Performance Evaluation and Benchmarking	3	0	0	3
SEN894	E	Game Design and Development	3	0	0	3

THIRD SEMESTER

Course Code	**Status**	**Course Title**	**Contact Hours**			**Unit**
			L	**T**	**P**	
SEN899	C	Individual Research Thesis		0	36	12
		Total				12

10. COURSE SYNOPSES

SEN 881 – Special Topics in Software Engineering (3 units)
Review of publications on the recent developments in Software Engineering. Experts and professionals in the industries and government establishments shall be

invited to address students on their experience. The course shall provide a platform for students to have direct interactions with the captains of Software Engineering in both public and private sectors of Nigeria. Some selected Nigerian in Diaspora shall be invited to address the students on their overseas experience. The students are given the opportunity to familiarize themselves with career structure and needs of the society. The platform provides the basis for the students to have insight into a new mindset for Software Engineering as an emergent and evolutionary platform for job and wealth creation. Recent topics and developments in software engineering are expected to be introduced from year to year. Apart from seminars to be delivered by lecturers or guests, students are expected to do substantial readings on their own.

SEN 882 - Software Engineering Modelling and Analysis (3 units)
UML modeling language; Approaches to model transformations and automated code generation; Model analyses methods; Basics of software engineering modeling tools; Key elements of software engineering methodologies; Industrial application of software engineering (experience and issues); System and multi–model development; Architectural design software engineering; Relevant research areas and directions; software engineering process models

SEN 883 - Research Methodology (3 units)
Research problem identification and formulation; research design; qualitative and quantitative research; measurement; sampling; data analysis; Interpretation of data and paper writing; use of encyclopedias, research guides, handbook etc., academic databases for computer science discipline; use of tools/techniques for research: reference management software, software for detection of plagiarism

SEN 884 – Emerging Trends in Software Engineering (3 units)
Security concepts, biometrics security, security risk management, design for security, system survivability, service–oriented software engineering – services as reusable components, service engineering, software development with services, aspect – oriented software development – the separation of concerns, aspects, joint points and point-cuts, software engineering with aspects

SEN 885 – Embedded Systems (3 units)
Typical embedded systems–core of the embedded system, memory, communication interface; embedded firmware; embedded real–time operating systems; real–time operating systems–based embedded system design; task communications and synchronisation

SEN 886 – Software Engineering Business (3 units)
Software proposal writing, accreditation, certification and licensing, codes of ethics, costing, marketing and professional conduct, nature and role of professional societies and software engineering standards, economic impact of software, employment contracts, legal issues, documentation, and trade–off analysis.

SEN 887 – Open Source Software (3 units)
Advanced open-source software development process, Covers economy, business, societal and intellectual property aspects of open source software. Obtain hands-on experience on open source software and related tools through developing various open source software applications such as mobile applications and web applications building on existing open-source frameworks and application development platforms.

SEN 888 - Group Dynamics and Communications (3 units)
Group dynamics and psychology – dynamics of working in teams/groups, individual cognition, dealing with problem complexity, interacting with stakeholders, dealing with uncertainty and ambiguity, and dealing with multicultural environments; Communication skills – reading, understanding and summarising, writing, teams and group communication, and presentation skills.

SEN 891 - Artificial Intelligence and Expert System (3 units)
General problem solving approaches in artificial intelligence, characteristic requirements for the realization of intelligent systems, programming languages for artificial intelligence and architecture for artificial intelligence machines; the psychological perspective of cognition; production systems; problem solving by intelligent search; the logic proposition and predicates; default and non-monotonic reasoning; structural approach to knowledge representation, the nature and goals of soft-computing, basic forms of inference; the representation and manipulation of knowledge in a computer; rule-based representations; logic-based representations; frames; semantic and partitioned nets; generation of explanations; handling of uncertainties; truth maintenance systems; expert system architectures; an analysis of some classic expert systems; building expert systems; methodologies for building expert systems: knowledge acquisition and elicitation, formalization, representation and evaluation; knowledge engineering tools; expert systems paradigms.

SEN 890 - Formal Methods of Software Engineering (3 units)
Advanced modelling principles, properties and expression of models, syntax, semantic and pragmatics, and preconditions, post–conditions, and invariants; Analysis of models – analyzing for completeness, consistency and correctness, traceability and interaction analysis; advanced software engineering methods – heuristic methods, formal methods, prototyping methods and agile methods.

SEN 893 - Big Data Analytics (3 units)
Nosql movement; the theory and techniques for data acquisition, cleansing, and aggregation; the principles and functionalities of big data programming models and tools; acquiring, processing, and managing large heterogeneous data collections; algorithms and systems for information and knowledge extraction from large data collections.

SEN 892 – Software Performance Evaluation and Benchmarking (3 units)
Software performance modeling; performance measurement techniques – on-chip performance monitoring, off-chip hardware monitoring, software monitoring, micro-coded instruction,, aggregating performance metrics over a benchmark suite, statistical techniques for computer performance analysis, statistical sampling for processor and cache simulation, statistical simulation, benchmark simulation and introduction to analytical models; energy and power simulator, validation

SEN 894 - Game Design and Development (3 units)
Platforms, goals and genres, player elements, story and character development, game play, levels, interface, audio, development team roles, game development process, and marketing and maintenance. Students will play games analyze them, and complete portions of game designs with appropriate documentation

SEN 899 - M. Phil. Research Project (12 units)
An independent investigation of an appropriate software engineering research problem is to be chosen by the student and approved by the Department. Each student works under the direction of a supervisor or group of supervisors. Before registering, the student must submit a written proposal to the supervisor(s) for review. The proposal should give a brief outline of the thesis, estimated schedule of completion, and computing resources needed. Each candidate is required to prepare a thesis, which represents the report of study, in an effectively organized and well-written form. The candidate is required to present at least two seminar papers before the final oral presentation. The thesis is examined based on the University regulations.

CURRICULUM FOR DOCTOR OF PHILOSOPHY (PH. D.) PROGRAMME IN SOFTWARE ENGINEERING

1. **PROGRAMME OFFERED:** Doctor of Philosophy (Ph.D.) in Software Engineering

2. **PROGRAMME PHILOSOPHY**

The last twenty years or so has seen a dramatic growth in the demand for professionals trained in Software Engineering. This growth was partly driven by tremendous technological advances, such as the Internet, the world–wide–web, and their applications. But the growth in demand was also driven by a much greater realization on the part of many organizations and individuals of the importance of software for their well–being, and the more widespread use of these technologies by individuals whose primary area of expertise was not in software engineering. With the emergence of technologies such as web, blockchain and AI, employers started to demand emerging skills to power these technologies. In the present age, there is a need for programme that will equip graduates with the software technologies that organizations needed to power their their software engineering infrastructures, or the web development skills required to take advantage of the many opportunities opened up by the Internet.

The Ph.D software engineering will provide sufficient understanding of organizational processes to be able to develop software applications. The programme is designed to provide students with necessary tools and techniques for software engineering. The curriculum emphasizes the art, science, engineering and technology of computing will comprise mainly course work and research activities in software engineering. In the first year of the programme, which consists of two semesters, students will be required to successfully complete the compulsory and/or elective courses in the

programme to be eligible to start their theses in the first semester of the second year. Each course will be assessed based on a written Continuous Assessment (CA) and a final examination at the end of the semester. Research for the Ph.D. degree programme will be independently carried out by the candidates under the supervision of members of staff of the Department. The programme is designed to extend frontiers of knowledge and making meaningful contributions to knowledge, particularly in software engineering which is an area of intense research and applications activities worldwide. Through the Ph.D. programme, much needed research and leadership personnel for academics, institutions, government and industries will be produced for national and international deployment.

PROGRAMME OBJECTIVES

The objectives of the programme are to:

The major aim of the PhD in software engineering programme is to provide an enabling platform to educate highly qualified researchers required for the expansion of fundamental knowledge and technological innovation through research and development, as well as the needs of institutions of higher learning. The specific objectives of the programme are to:

i. inspire candidates to know the current research fields and the relevant models in the field of software engineering and other computing fields;
ii. inspire candidates to conduct intense researches in the field of science and information technology with a view to provide software solutions to some societal problems;
iii. train candidates to cultivate wide-ranging hands-on and hypothetical knowledge in high-performance computing and application areas for the overall gain of the private and public sectors of the economy;
iv. train candidates on how to determine related problems and adopting computing-based methods to proffer solutions; and
v. train candidates to master relevant skills for thorough and detailed analysis of advanced studies in relevant domain of knowledge.

4. PROGRAMME JUSTIFICATION

The field of Software Engineering is dynamic and always experience new inventions, thus, makes it imperative to have a cutting-edge training and solid curriculum to match these emergent developments. Moreover, the demand for IT programmes has risen in recent times due to these evolving discoveries. In view of the above considerations, the department of Software Engineering is proposing the Ph.D. Software Engineering programme. This course aligns with the vision and mission of the Federal University of Technology, Akure.

5. ADMISSION REQUIREMENTS

The requirements for admission into the PhD programme consist of:

i. M. Tech in Software Engineering or other related discipline from the Federal University of Technology. Akure, Nigeria with a CGPA of not less than 3.5 on a 5-point credit scale, or
ii. M. Tech. or M. Sc. in Software Engineering or other related discipline from other reputable institutions with a CGPA of not less than 3.5 on a 5-point (3.0 on a 4-point) credit scale or a minimum overall score of 60%, or
iii. M. Phil. in Software Engineering from the Federal University of Technology, Akure, Nigeria or other a recognized/reputable universities with a CGPA of not less than 3.5 on a 5-point (3.0 on a 4-point) credit scale or a minimum overall score of 60%.

6. PROGRAMME DURATION

The Ph.D. programme shall run for a minimum of 36 months and a maximum of 48 months of intensive research for full time and a minimum of 48 months and a maximum of 60 months for part-time students.

7. GRADUATION REQUIREMENTS

To be eligible for the award of Ph.D. in Software Engineering, a candidate must have carried out an independent research work in his/her specialization under the general supervision of selected senior academic staff in the chosen field of research. The candidate must demonstrate high scholastic ability through the research. The thesis emanating from the research should exhibit originality and the result must form distinct contributions to knowledge. In carrying out this main requirement:

a. candidate must in consultation with his/her supervisors, present a comprehensive research proposal seminar in the department successfully within the first year of study;

b. candidate must also present progress seminar in the department successfully;
c. on completion of the research, the candidate must present an end-of-thesis seminar successfully in the department;
d. A candidate after carrying out satisfactorily post seminar review, must submit the required number of copies of thesis for a viva; and pass satisfactorily the oral examination of the submitted thesis before a panel of examiners; and
e. fulfilled all other conditions as approved by the School of Postgraduate Studies and the University.

8. COURSE OUTLINE

PhD in Software Engineering					
Course Code	**Course Title**	**L**	**T**	**P**	**Unit(s)**
SEN999	PhD Research Project	0	0	36	12

9. COURSE SYNOPSES

SEN 999 - PhD Thesis research Project (12 units)

An independent or group investigation of appropriate software or IT related problems in Software Engineering carried out under the supervision of a lecturer. Before registering, the student must submit a written proposal to the supervisor to review. The proposal should give a brief outline of the project, estimated schedule of completion, and computer resources needed. Each candidate is required to prepare a thesis, which represents the report of the study, in an effectively organized and well written form. The candidate is required to present at least three seminar papers before the final oral presentation. The thesis is examined according to the university regulations. The following are some of the major areas of research for which the facilities available to students and staff of the Department can support: soft computing, intelligent systems, computer and information systems, web applications, distributed systems, expert systems, system securities, modelling and simulations, games applications, multi-media systems, big data analytics, data mining and warehousing and system networking. Candidates applying for PhD in Software Engineering programme are strongly advised to consider these areas.

CURRICULUM FOR PROFESSIONAL COURSES IN SOFTWARE ENGINEERING

PROFESSIONAL COURSES

The Department will run certificate courses in the following programmes:

- **WEB APPLICATIONS**

Overview: The programme will be of great help to learners willing to expand their knowledge in *application* development. *eb* Programming/ *eb* Design. The program will give the foundation for building full stack web apps using the Java programming language. Candidates will begin with the basics of JavaScript, and then venture into some of the more advanced concepts like Angular, Spring Boot, Hibernate, JSPs, and MVC. Now is a perfect time to get started on your career as a full stack web developer

Learning Details: Angular, Spring Boot, Hibernate, Servlets and JSPs, MVC, JavaScript, jQuery, MongoDB, planning and UI design, backend and database development, API end points and communication, integration and deployment and many more cutting edge topics.

Qualification: Minimum of ordinary level certificate or its equivalent.

Duration: 6 months

- **MICROSOFT AZURE FUNDAMENTALS**

Overview: The course will enhance candidates' knowledge of cloud computing and cloud-based programmes. Completing the course will lead to proficiency in Azure services, security and privacy in Azure and Azure workload. Having prior knowledge of important software engineering concepts like networking, storage, application development and application support is beneficial. This foundation-level certification can help entry-level software engineers working on data and artificial intelligence (AI) jobs.

Learning Details: Cloud Concept, core azure services, core solution and management tools, general and networking security, identity governance, privacy compliance, etc.

Qualification: Minimum of ordinary level certificate or its equivalent.

Duration: 6 months

- **AGILE SOFTWARE DEVELOPMENT**

Overview: Candidates will learn about the power of the *oftware Development* Lifecycle (SDLC), and modern *software development* frameworks methodologies like *gile* and Scrum. It will assist students to explore online *software* engineering courses to advance their computer programming and *software development* skills and career. Students will be taught how to adopt small batches, minimum viable product, pair programming, behavior- and test-driven development. It will also include learning on writing good user stories, estimate and assign story points and track stories using a kanban board. Incorporate Scrum artifacts, events, and benefits. It will also present to candidates the methods for creating and refining a product backlog using the sprint planning process. Produce potentially shippable product increments with every iteration.

Learning Details: Philosophy and characteristics of agile**,** other methodologies including Waterfall, Extreme Programming (XP) and Kanban, and how they relate to Agile, overview of Scrum as a framework for applying Agile principles to project management. Benefits of Scrum to project management process by advocating defined roles, events, and artifacts. How companies can organize for success using Agile, and how team alignment and autonomy contribute to building better systems. Recognize and avoid Agile anti-patterns and measure Scrum team health. Agile iterative planning. You will also learn how to create good user stories, estimate and assign story points, build and refine a product backlog, and build a sprint plan. Daily workflow for executing a sprint plan, including how to determine which story to work on and how to keep the team updated on progress. Understanding and running daily stand-up. Using burndown charts to forecast team's ability to achieve the sprint goal. Conducting the sprint review and the sprint retrospective. Measuring success and using actionable metrics to improve team's performance.

Qualification: Minimum of ordinary level certificate or its

Duration: 6 months

- **PYTHON FOR ARTIFICIAL INTELLIGENCE**

Overview: The course will present the steps and processes involved in creating a Python application including the application development lifecycle to candidates. It will also focus on creating Python modules, run unit tests, and package applications while ensuring the PEP8 coding best practices. It will help students to understand the features of Flask and deploy applications on the web using the Flask framework as well as creating and deploying an AI-based application onto a web server using IBM Watson AI Libraries and Flask.

Learning Details: Basic difference between web applications and APIs. Next, the application development lifecycle, from gathering requirements to maintaining the project. The best practices for coding as documented in the Python Enhancement Proposal (PEP8) style guide. Static code analysis for ensuring that codes adhere to the coding rules. Creating and running unit tests. creating, verifying, and running Python packages. Definitions of and key differences between Python libraries and frameworks for application development. Flask, a Python-based micro framework used for web deployment of applications. Development and deployment concepts, including routes, request and response objects, error handling, and decorators. Deployment of web apps using Flask. Embeddable Watson AI libraries. Building AI-based apps.

- **DEVELOPMENT OPERATIONS ENGINEERING**

Overview: Development Operations **(**DevOps) is a methodology in the software development and IT industry. Used as a set of practices and tools, DevOps integrates and automates the work of software development (Dev) and IT operations (Ops) as a means for improving and shortening the systems development life cycle. DevOps is the combination of cultural philosophies, practices, and tools that increases an organisation's ability to deliver applications and services at high velocity: evolving and improving products faster than organisations using traditional software development and infrastructure management processes. This speed enables organizations to better serve their customers and compete more effectively in the market. Software and the Internet have transformed the world and its industries, from shopping to entertainment to banking. Software no longer merely supports a business; rather it becomes an integral component of every part of a business. Companies interact with their customers through software delivered as online services or applications and on all sorts of devices. They also use

software to increase operational efficiencies by transforming every part of the value chain, such as logistics, communications, and operations. In a similar way that physical goods companies transformed how they design, build, and deliver products using industrial automation throughout the 20th century, companies in today's world must transform how they build and deliver software.

Learning details: Introduction to DevOps, Version Control Systems, Continuous Integration, Continuous Deployment, and Build Tools. Software and Automation, Testing Frameworks, Configuration, Management Tools. Containerization with Docker. Continuous Monitoring. Need of Cloud in DevOps. Practice Projects.

Qualification: Minimum of ordinary level certificate or its equivalent.

Duration: 6 months

10. LIST OF ACADEMIC STAFF

S/N	Academic Staff	Area of Specialisation	Discipline	Qualification	Rank
1	Prof. G. B. Iwasokun	Biometric Security, Image Processing	Software Engineering	B. Tech., M. Tech, PhD (Akure)	Professor/ Ag. HoD
2	Prof. O. C. Akinyokun	Database System, Artificial Intelligence, Computer Network	Software Engineering	B. Sc. (Ife), PhD (East-Anglia, UK)	Professor
3	Prof. B. K. Alese	Cybersecurity, soft computing	Computer Science	B. Tech., M. Tech., PhD (Akure)	Professor (Associate)
4	Prof. K. G. Akintola	Software Engineering, Computer Vision	Software Engineering	B. Tech, M. Tech. (Akure), MCIS (Houston, USA) PhD (Akure)	Professor
5	Prof. S. A. Oluwadare	Computer Networks, Soft Computing, Software Engineering	Computer Science	B. Sc. (Ibadan), M. Tech. (Akure), PhD (Akure)	Professor (Associate)
6	Prof. (Mrs) O. K. Boyinbode	Soft-computing, Machine Learning, Mobile Computing	Computer Science	B. Tech. (Akure), M. Sc. (Lagos), PhD (Cape Town)	Professor (Associate)
7	Dr A. F. Osuolale	Network and System Security	Computer Science	B. Sc. (Akure), M. Tech. (Akure), PhD (Akure)	Senior Lecturer (Associate)
8	Dr (Mrs) O. Owolafe	Machine learning and Soft-Computing	Computer Science	B. Sc. (Abakaliki), M. Tech. (Akure), PhD (Akure)	Senior Lecturer (Associate)
9	Dr D. B. Adewole	Artificial Intelligence, Network and System Security	Computer and Software Engineering	B. Sc. (Ife), M. Tech. (Akure), PhD (Akure)	Lecturer I
10	Dr (Mrs) O. Agbelusi	Information Security, Data Science	Software Engineering	B. Sc. (Ado-Ekiti), M. Tech. (Akure), PhD (Akure)	Lecturer I
11	Dr (Mrs) A. H. Afolayan	Artificial Intelligence and Expert System Information Security	Computer Science	B. Tech. (Akure), M. Tech. (Akure), PhD (Akure)	Lecturer 1
12	Mrs. O. V. Olatunde	Machine Learning, Software Engineering	Software Engineering	B. Sc., M. Sc. (Ilorin)	Lecturer I
13	Dr S. I. Olotu	Information Technology	Computer Science	B. Eng'g. (Ogbomoso), M. Tech. (Akure), PhD (Akure)	Lecturer I (Associate)
14	Mr. O. O. Ogunbodede	Information Security and Software Engineering	Computer Science	B. Sc. (Benin), M. Sc. (Ibadan)	Assistant Lecturer
15	Mr. I. T. Jimoh	Machine Learning and System Security	Computer Science	B. Tech. (Akure), M. Tech. (Akure)	Assistant Lecturer

9.4 SCHOOL OF EARTH AND MINERAL SCIENCES

9.4.1 DEPARTMENT OF APPLIED GEOLOGY (AGY)

PROGRAMMES OFFERED

a. Postgraduate Diploma (PGD) in Applied Geology

b. Master of Technology (M.Tech.) with options in:

(i) Mineral Exploration
(ii) Remote Sensing
(iii) Hydrogeology/Engineering Geology
(iv) Petroleum/Sedimentary Geology

c. Doctor of Philosophy (PhD) with research in the following fields of specialization

(i)Mineral Exploration
(ii) Economic/Mining Geology
(iii) Exploration Geochemistry
(iv) Structural Geology
(v) Remote Sensing
(vi) Petroleum Geology
(vii) Sedimentary Geology/Stratigraphy
(viii) Hydrogeology
(ix) Engineering Geology

PHILOSOPHY AND OBJECTIVES

a. Post Graduate Diploma (PGD) programme

The programme is a part-time weekend course aimed at:

i) Assisting practicing graduates of physical/allied sciences or engineering in earth science related fields to acquire additional knowledge of geology required in their jobs.

ii) Serving as a refresher course for employed geoscientists interested in updating their knowledge of applied geology while remaining in full-time employment.

iii) Serving as a bridge-programme for Higher Diploma holders in the fields of geosciences and mining who wish to become professional practitioners.

b. Master of Technology (M.Tech)/ Doctor of Philosophy (PhD) programmes

The postgraduate degree programmes are designed to provide sound in-depth training in the applied aspect of Geology in such a way that our products are of direct relevance to national economic development. The courses have therefore been adequately structured to ensure the attainment of the desired intellectual development, as well as professional skill and competence in the student.

The objectives of the programmes are to:

(i). equip the student with capability to explore and harness earth resources namely, water, solid minerals, bitumen, oil and gas;

(ii). produce postgraduate students that are versatile in the practice of geological sciences and are engaged in carrying out meaningful research of direct relevance to the society; and

(iii). establish link with relevant industries in the nation with a view to solving industrial practical problems.

ADMISSION REQUIREMENTS

a. Postgraduate Diploma inApplied Geology

A prospective candidate for the programme should possess minimum of either

(i) a honours degree in any science-based or earth-related engineering field from any university recognized by Senate, or

(ii) a higher national diploma or equivalent at lower credit level in Geology, Mineral Resources, Water Resources, Hydrology, Mining, Petroleum Engineering, Civil

Engineering or Metallurgy from any recognized tertiary institution.

b. Master of Technology (M.Tech)

In addition to the general regulations and guidelines on admission, a candidate shall normally possess a minimum of:

(I) Second Class Lower division degree in Geology from this university or any other university recognized by Senate.

(ii) Second Class Upper division degree in Applied Geophysics, Mining Engineering, Petroleum Engineering and Metallurgy.

(iii) a postgraduate diploma (PGD) in Geology at upper credit level along with any of the following qualifications: a Third Class division degree in Geology or HND lower credit in Geology or Second Class Lower division degree in any science-based or earth-related engineering field.

c. Doctor of Philosophy (PhD)

To qualify for admission into the PhD programme, a candidate must possess a Master's degree with a minimum of 60% grade each in the Master's course work and in the research project from any university recognized by Senate. The programme shall normally be by research and specialized coursework whereby holders of Master's degrees from institutions other than this university may be required to audit and pass some courses that may be prescribed by the department.

DURATION OF PROGRAMMES

a. Postgraduate Diploma inApplied Geology

This is a part-time programme and covers a period of 4 semesters. It runs only at week-ends, normally from Friday afternoon to Saturday evening but also on Sunday when necessary.

b. Master of Technology

Full Time: 18 Months.

c. Doctor of Philosophy

Full Time: 36 Months.

Part Time: 48 Months.

* Upon application, Senate may approve an extension where necessary.

REQUIREMENTS FOR GRADUATION

a. Postgraduate Diploma

Each student must register for and pass a minimum of 41 credit units, which must include 6 units of supervised research project.

b. Master of Technology

Each student must register for and pass a minimum of 46 - 48 credit units depending on option, and this must include 12 units of supervised research project.

c. Doctor of Philosophy

All candidates are expected to carry out original research projects supervised by approved post-graduate lecturers and successfully defend same in accordance with the post-graduate school regulations.

COURSE OUTLINE FOR EACH PROGRAMME

a. Postgraduate Diploma

PGD Year I: 1ST Semester

Course Code	Course Title			L	T		
AGY 701	Crystallography & Mineralogy		1		0		3
AGY 703	Igneous & Metamorphic Petrology		1		0		3
AGY 705	Sedimentology & Stratigraphy		1		0		3
AGY 707	Geological Map Interpretation		1		0		3
AGY 709	Introduction To Geostatistics & Computing	1	0		3		2
	Total						10

2ND Semester

Course Code	Course Title	L	T	P	U
AGY 702	Geochemistry	1	0	3	2
AGY 704	Structural Geology & Global Tectonics	1	0	3	2
AGY 706	Paleontology	1	0	3	2
AGY 708	Remote Sensing Techniques & Applications	1	0	3	2
AGY 710	Exploration Geophysics	1	0	3	2
	Total				10

PGD Year II: *1ST Semester*

Course Code	Course Title			L	T	P	U
AGY 711	Hydrogeology			1	0	3	
AGY 713	Engineering Geology		1		0	3	2
AGY 715	Petroleum Geology			1	0	3	2
AGY 717	Economic Geology			1	0	3	2
AGY 719	Exploration & Mining Geology	1	0		3		2
	Total				10		

2ND Semester

Course Code	Course Title	L	T	P	U
AGY 712	Geology of Nigeria	1	0	3	2
AGY 714	Geological Field Mapping	0	0	6	2
AGY 716	Seminar	0	0	3	1
AGY 799	PGD Research Project	0	0	0	6
	Total				**11**

b. M.Tech

(i) M.Tech Applied Geology (Mineral Exploration Option) *1ST Semester*

Course Code	Course Title	L	T	P	U
AGY 801	Mineral Prospecting & Exploration	1	0	3	2
AGY 803	Advanced Structural Geology	2	0	3	3
AGY 805	Remote Sensing in Applied Geology	1	0	3	2
AGY 807	Geochemical Exploration I	2	0	3	3
AGY 811	Advanced Petrology	2	0	3	3
AGY 829	Ore Mineralogy	2	0	3	3
AGP 815	Advanced Electromagnetic Methods	2	0	3	3
	Total				**19**

2ND Semester

Course Code	Course Title		L	T	P	U
AGY 804	Data Analyses i n Geology	1	0	3		2
AGY 806	Industrial Minerals	1	0	3		2
AGY 808	Mining Geology	1	0	3		2
AGY 812	Geochemical Exploration II	2	0	3		3
AGY14	PG Seminar in Applied Geology	0	0	6		2
AGY816	Ore Deposits	2	0	3		3
AGY844	Advanced Geological Mapping	0	0	18		6
AGP824	Gravimetric and Magnetic Methods	2	0	3		3
	Total					**23**

iii) M. Tech Applied Geology (Remote Sensing Option)

1ST Semester

Course Code	Course Title	L	T	P	U
AGY 803	Advanced Structural Geology	2	0	3	3
AGY 805	Remote Sensing in Applied Geology	1	0	3	2
AGY 809	Non-Optical Systems	1	0	3	2
AGY 811	Advanced Petrology	2	0	3	3
AGY 815	Sedimentary Petrology	2	0	3	3
AGY 821	Groundwater Hydrology	2	0	3	3
AGY 823	Optical Systems	2	0	3	3
	Total				**19**

2ND Semester

Course Code	Course Title		L	T	P	U
AGY 804	Data Analyses i n Geology	1	0	3		2
AGY 814	PG Seminar i n Applied Geology	0	0	6		2
AGY 816	Ore Deposits	2	0	3		3
AGY 820	Sedimentary Depositional Systems	1	0	3		2
AGY 822	Geographic Information System	1	0	3		2
AGY 824	Digital Image Processing	1	0	3		2
AGY 826	Geology o f Petroleum	2	0	3		3
AGY 828	Remote Sensing Applications	1	0	3		2
AGY 844	Advanced Geological Mapping	0	0	18		6
AGP 824	Gravimetric and Magnetic Methods	2	0	3		3
	Total					**27**

(iv) M. Tech Applied Geology (Hydrogeology & Engineering Geology Option)

1ST Semester

Course Code	Course Title	L	T	P	U
AGY803	Advanced Structural Geology	2	0	3	3
AGY805	Remote Sensing In Applied Geology	1	0	3	2
AGY811	Advanced Petrology	2	0	3	3
AGY821	Groundwater Hydrology	2	0	3	3
AGY825	Advanced Engineering Geology	2	0	3	3
AGY827	Soil Mechanics	1	0	3	2
AGP815	Advanced Electromagnetic Method	2	0	3	3
	Total				**19**

2ND Semester

Course Code	Course Title		L	T	P	U
AGY 804	Data Analyses i n Geology	1	0	3		2
AGY 814	PG Seminar i n Applied Geology	0	0	6		2
AGY 830	Environmental Hydrogeology	2	0	3		3
AGY 832	Foundation Systems	2	0	0		2
AGY 834	Rock Mechanics	1	0	3		2
AGY 836	Quantitative Hydrogeology	1	0	3		2
AGY 844	Advanced Geological Mapping	0	0	18		6
AGP 824	Gravity & Magnetic Methods	2	0	3		3
	Total					**22**

(v) M. Tech Applied Geology (Petroleum & Sedimentary Geology Option)

1ST Semester

Course Code	Course Title	L	T	P	U
AGY 803	Advanced Structural Geology	2	0	3	3
AGY 805	Remote Sensing in Applied Geology	1	0	3	2
AGY 811	Advanced Petrology	2	0	3	3
AGY 813	Micropaleontolo gy	2	0	3	3
AGY 815	Sedimentary Petrology	1	0	3	2
AGY 817	Energy Resources	2	0	0	2
AGY 819	Basin Analysis and Sequence Stratigraphy	1	0	3	2
	Total				**17**

2ND Semester

Course Code	Course Title		L	T	P	U
AGY 804	Data Analyses in Geology	1	0	3		2
AGY 814	PG Seminar i n Applied Geology	0	0	6		2
AGY 818	Subsurface & Reservoir Geology	2	0	3		3
AGY 820	Sedimentary Depositional Systems	1	0	3		2
AGY 826	Geology o f Petroleum	2	0	3		3
AGY 838	Clay Mineralogy	1	0	3		2
AGY 840	Palynology	1	0	3		2
AGY 844	Advanced Geological Mapping	0	0	18		6
AGP 822	Seismic Prospecting Methods	2	0	3		3
AGP 824	Geophysical Borehole Logging	2	0	3		3
	Total					**18**

3RD SEMESTER FOR ALL THE OPTIONS

Course Code	Course Title	L	T	P	U
AGY 899	Thesis Research	0	0	36	12
	Total	**0**	**0**	**36**	**12**

C. Doctor of Philosophy

Every Semester

Course Code	Course Title		L	T	P	U
AGY 999	PhD Thesis Research	0	0	0		12
	Total					**12**

COURSE SYNOPSES

a. Postgraduate Diploma

AGY 701 Crystallography & Mineralogy (2units)

Formation of a crystal: principles of crystal chemistry, crystal state, crystal structure, crystallographic notations, crystal lattice and unit cell. Elements of symmetry, crystal systems, twinning, systematic of mineralogy, silicate structures. Characteristic properties and propagation of light. The polarizing microscope. Origin, identification, classification and distribution of minerals. Systematic description and occurrence of common rock-forming minerals. Association of minerals in rocks. Principles of optical mineralogy. Identification of common rock-forming minerals in parallel and convergent light under the polarizing microscope. Introduction to x-ray crystallography.

AGY 702 Geochemistry (2 units)

Classification and distribution of elements in the cosmic system, lithosphere, hydrosphere and atmosphere. Principles of major and trace elements analysis, preparation and analytical procedures. Field operations: sample collection and processing; map preparation and interpretation. Case histories. Computer applications.

AGY 703: Igneous and Metamorphic Petrology (2 units)

Origin, occurrence, geological setting and systematic description of igneous rocks; extrusive and intrusive igneous processes. Magmatic crystallization and phase equilibria; the genesis of selected igneous rocks. Granite rocks: classification and petrogenesis. Older and Younger Granites of Nigeria, charnockites, kimberlites serpentinite and carbonatite. Metamorphism: agents and types. Description of metamorphic rocks. Metamorphic facies and facies series. Metamorphic minerals and textures of metamorphic rocks. Evolution of gneisses and migmatites; anatexis, metasomatism and granitisation. Orogeny, carbonatite problem; eclogites.

AGY 704: Structural Geology & Global Tectonics (2 units)

Stress and strain analyses in rocks. Deformation behaviour of rock materials: failure; fold and fracturing; use of Mohr Circle. Shear zones, salt domes and diapirism. Crystal defects, dislocation and recrystallization. Deformation mechanisms and development of textures. Stereographic projections. Fundamentals of plate tectonics; applications of plate tectonics in crustal evolution and mineral exploration. Analysis of large-scale regional structures.

AGY 705: Sedimentology & Stratigraphy (2 units)

Origin of different kinds of sedimentary rocks. Agents of sedimentation: physical, biological and chemical processes. Diagenesis; fundamental properties of sedimentary rocks. Environment of deposition. Concepts of chronostratigraphy, lithostratigraphy, biostratigraphy, magnetostratigraphy and stratotypes. Principles of stratigraphic classification and terminologies; correlation; evolution of sedimentary basins. Facies analysis.

AGY 706: Paleontology (2 units)

Fossils and fossilization. Morphology, evolution, identification and stratigraphic significance of major animal phyla, viz.:- protozoa, porifera, coelenterata, brachiopoda, mollusca, arthropoda, echinodermata, graptolithina, foraminifera, ostracoda and conodonts, plants (pores and pollens) and trace fossils. Fossil records and geological time scale.

AGY 707: Geological Map Interpretation (2 units)

Elements of topographic maps. Detailed interpretation of topographic and geological maps- map preparation. Determination of geometric forms of outcrops. Recognition of geological structures on maps. Interpretation of subsurface data. Three-point problems.

AGY 708: Remote Sensing Techniques & Applications (2 units)

Concepts and foundations of remote sensing. Types of sensors. Aerial photography types. Principles of stereoscopic vision. Aerial photo interpretation. Non-photographic remote sensing systems. Acquisition of data, processing and enhancement. Interpreting techniques. Multi-spectral scanning systems. Surface thermal properties; interpretation of infra-red images. Imaging radar techniques. Case histories and applications.

AGY 709: Introduction to Geostatistics & Computing (2 units)

Elements of probability and probability distribution: normal, binomial, geometric, etc. Estimation and tests of hypothesis concerning parameters of distribution. Regression, correlation and analysis of variance. Multivariate data analysis. Broad introduction to computer, compiler, editor. Introduction to FORTRAN programming as a tool. Principles of structured programming. Introduction to various computer packages for 2-D & 3-D geostatistical data presentation.

AGY 710: Exploration Geophysic (2 units)

An introduction to geophysical prospecting methods-fundamental principles. Electrical properties of rocks and minerals. Self- and induced potentials; equipotential methods. Interpretation of data. Generation and propagation of seismic waves; travel time graphs for layered media; seismic velocity and its relationship to rock properties. Gravity and magnetic methods, Data collection and interpretation; Electromagnetic technique.

AGY 711: Hydrogeology (2 units)

Hydrological cycle. Hydrometeorology- rainfall, overland flow, interflow, etc. hydrographs. Occurrence and movement of groundwater. Hydrological properties of rocks. Aquifers and types. Springs. Physics of groundwater flow. Well hydraulics. Saline intrusions & coastal hydraulics. Groundwater exploration and exploitation techniques. Quality of groundwater. Environmental hydrogeology. Effects of groundwater on engineering construction materials. Hydrogeological maps.

AGY 712. Geology of Nigeria (2 units)

Major geomorphic and structural elements in Nigeria. The Basement Complex- origin, structure. Evolution of early to middle Proterozoic rocks in Nigeria. Evolution of Nigerian Schist Belts. Schist Belt mineralization. The Pan African orogeny and evolution of the associated granites. Younger Granites in the Jurassic geology of Nigeria. Rock dating techniques. Rb/Sr, K/Ar and U/Pb dating methods. Precambrian geochronology of Nigeria. Sedimentary basins in Nigeria. Intracratonic and peri-cratonic basins. Mineralization in the basins.

AGY 713: Engineering Geology (2 units)

Particulate nature of soils; index properties of soils and rocks. Strength characteristics and classification of soils and rocks. Clays and other soil types. Soils and rocks as construction materials. Site investigation- direct and indirect techniques. Engineering geological maps. Rock and soil slope stability. Methods of ground improvement. Seepage and erosion problems. Retaining walls, dams, highways and foundation types.

AGY 714: Geological Field Mapping (2 units)

A field-based course lasting three continuous weeks and involving techniques of gathering geological data from rock exposures, boreholes and pits. Measurement of geological parameters on sedimentary and crystalline rocks on the field. Field recognition of geological structures. Environmental conditions assessment.

AGY 715: Petroleum Geology (2 units)

The origin, migration and accumulation of hydrocarbons. Source rock characteristics and maturation scheme. Reservoir rocks and traps. Subsurface maps. Well logs, seismic data acquisition, processing and interpretation. Evaluation of petroleum potentials and reserves. Oil and Gas wells: drilling, completion and production. Global oil reserves. Oil deposits in Nigeria. Oil and geopolitics.

AGY 716: Seminar (1 unit)

Each student will present seminar on a special topic from any field ofApplied Geology.

AGY 717: Economic Geology (2 units)

Processes of formation of mineral deposits, environments and localization of ore deposits. Wall-rock alteration; paragenesis and zoning in mineral deposits; textures and classification of ore deposits**.** Gemstones**-** crystal forms and habit. Physical properties of minerals and crystals. Synthetic and imitation stones. Fashioning of gemstones. Outline of methods used by diamond cutters and lapidaries. Metallogeny. Methods of acquisition and exploitation of mineral deposits.

AGY 719: Exploration & Mining Geology (2 units)

Mode of occurrence and factors controlling ore deposition. Metallic and non-metallic mineral resources; fossil fuels. Exploration techniques: geological, geochemical, geophysical and remote sensing. Types of drilling and machinery. Roles of geologists in drilling and mining. Ore reserves estimation and classification. Mines and mining methods. Introduction to mineral rights and laws. Pollution study, prediction and control of geologic hazards.

AGY 799: PGD Research Project (6 units)

An independent research work in any area of Applied Geology will be assigned to each student as project at the beginning of Year Two. The student will present the project report for oral examination at the end of the session.

MASTER OF TECHNOLOGY (M.TECH)

AGY 801: Mineral Prospecting and Exploration (2 Units)

History of mineral prospecting. Types of mineral deposits. Guides to mineralization and criteria for mineral prospecting. Prospecting methods. Applications of geophysical and geochemical methods in mineral exploration. Stages of exploration for mineral deposits. Drilling, logging and interpretation of drill-hole data. Methods of ore sampling in outcrops, open pits and underground mines. Definition and types of ore reserves. Ore reserve calculation. Exploration of alluvial deposits.

AGY 803: Advanced Structural Geology (2 Units)

Concepts of stress and strain. Finite strain determination in rocks. Cleavage, foliation and lineation development. Fold geometry, polyphase folding and fold interference patterns. Fault geometry. Thrust faults, balanced and restored cross sections. Brittle and ductile shear zones. Deformation mechanisms, recovery and recrystallization. Structural analyses; stereographic projection of structural data. Plate tectonics and major earth structures.

AGY 804: Data Analysis In Geology (2units)

Statistical analyses of geological data and graphical presentation techniques. Handling of vectors and matrices. Iteration techniques. FORTRAN Programming. Introduction to use of computer graphics packages (GRAPHER**,**

SURFER, SPSS, GEOGRAPHICS, WINFENCE, GWW e.t.c.) in geological data presentation.

AGY 805: Remote Sensing in Geology (3Units)

Principles of geological interpretation of aerial photographs and their applications to geological mapping and mineral exploration. Satellite remote sensing. Sensors, principles and capabilities in analyses of imagery. Interpretation of geological features and structures from satellite imagery.

AGY 806: Industrial Minerals and Rocks (2 Units)

Geology of major industrial minerals and rocks. Review of the principal raw materials for construction, ceramics, glass, dimension stones, metallurgical, refractory, chemical and fertilizer industries etc. Methods of determination of their mineralogical, geotechnical and chemical properties.

AGY 807: Geochemical Exploration I (3 Units)

Introduction to the applications of geochemistry in mineral exploration Principles of geochemical dispersion and reconcentration in rock and ore systems. Primary dispersion patterns. Weathering, soil formation and the migration of economic and pathfinder elements in the secondary environment. Secondary dispersion patterns. Geochemical soil and drainage surveys. Biogeochemical, geobotanical and atmosgeochemical surveys

AGY 808: Mining Geology (2 Units)

Types of mines and mining methods. Stages in mine development. Mine mapping and mine exploration. Drilling, sampling and assaying of mineral deposits. Handling and transportation of ores. Mineral processing and beneficiation of ores. Mineral economics, metal prices. Mine safety, health and environmental protection. Geopolitics and mineral resource development . Nigerian mining laws.

AGY 809: Non-Optical Systems in Remote Sensing. (2 Units)

Thermal infrared Imagery. Thermal processes and properties of different materials. Infrared detection and imaging technology. Techniques of interpretation of infrared images. Radar imagery; the SLAR system image interpretation procedures. Radar imagery from satellites. Interferrometric synthetic aperture radar (INSAR) imagery.

AGY 831: Advanced Igneous and Metamorphic Petrology(2 Units)

Origin and evolution of magmas; melting and crystallization models. Phase diagrams, petrological variation diagrams. Use of trace element in igneous petrogenesis. Isotopes in igneous petrology. Types and fields of metamorphism. Chemical equilibrium in metamorphism, the phase rule, metamorphic reactions, graphical representation of metamorphic parageneses. Metamorphic facies and facies series. Metamorphism and deformation. Geothermometry and Geobarometry.

AGY 812 : Geochemical Exploration II (3 Units)

Geochemical affinity and geochemistry of important ore and pathfinder elements. Primary dispersion patterns around hydrothermal ore deposits, their enhancement and interpretation. Advanced geochemical prospecting techniques including applications to uranium prospecting. X-R-F and other methods of instrumental analyses. Advanced statistics and evaluation of geochemical data

AGY 813: Micropaleontology (2 Units)

Morphology, taxonomy, evolution, ecology and stratigraphic distribution of different groups of Foraminifera, Ostracods, and Calcareous Nannofossils (particularly Coccoliths, Discoasters, Radiolorian, Diatoms, Silicoflagellates, Conodonts and Pteropods). Ecological and paleoecological relationships of living and fossil microorganisms. Applications of micropaleontology to high resolution biostratigraphy. Paleobathymetry. Paleofacies analyses and paleoecology in oil exploration. Application of micropaleontology to other fields.

AGY 814: Postgraduate Seminar in Applied Geology (2 Units)

Literature review, write up and oral presentation of a topic on an aspect of applied geology in the area of specialization of the student

AGY 815: Sedimentary Petrology (3 Units)

Origin and classification of sedimentary particles Mineralogy of terrestrial sedimentary particles: quartz, feldspar, mica, heavy minerals and rock fragments. Bulk composition of sedimentary rocks: Grain morphometrics and grain size analyses of conglomerates and sandstones, and their relationship to provenance. Matrix of siliciclastic and carbonate rocks. Diagenesis in sandstones and limestones Composition of evaporites, chert, phosphate, iron-rich and manganese-rich rocks.Relationship of sandstone petrography to tectonics and sedimentation Field and laboratory methods of study of sedimentary rocks (texture, petrography etc)

AGY 816: Ore Deposits (3 Units)

Classification of ore deposits in relation to genesis and tectonic setting. Physical and chemical conditions of ore formation. Shape, mineralogy, genesis of magmatic, pegmatitic, carbonatite, hydrothermal and volcano-sedimentary ore deposits. Skarn and metamorphic ore deposits. Supergene and sedimentary ore deposits. Paragenesis and zoning. Wall rock alteration. Fluid inclusions and geothermometry. Metallic mineral deposits in Nigeria.

AGY 817: Energy Resources (2 Units)

Overview of conventional and non-conventional energy resources. Occurrence, exploration and exploration of the various sources of energy. World-wide distribution of energy resources.

AGY 818: Subsurface and Reservoir Geology (3 Units)

Concept of subsurface geology. Subsurface data acquisition. Drilling: cable and rotary drilling techniques. Well logs, mud logs, SP, Resistivity, Caliper, gamma ray, density and sonic logs (their petrophysical and reservoir characterization significance). Construction and Interpretation of subsurface maps, cross-sections and seismic stratigraphic data

AGY 819: Basin Analysis and Sequence Stratigraphy (2 Units)

Physiography of sedimentary basins. Tectonic evolution of sedimentary basins, origin of basins through crustal sag, tension, compression and wrenching. Metallogeny and Petroleum Systems in sedimentary basins. Facies relationship and depositional sequences. Aspects of sequence stratigraphy: relationship between sequence boundaries and systems tracts. Evolution of sequence stratigraphic models: Nigerian basins as case studies.

AGY 820: Sedimentary Depositional Systems (2 Units)

Techniques of environmental diagnosis; rock geometry, lithologies, rock textures, sedimentary structures, paleocurrent patterns, fossils, sequences and cycles. Study of facies relations in modern depositional environments of both carbonate and terrigeneous sediments and applications to ancient sedimentary deposits. Environmental analyses of river, lake, delta, clastic shoreline, carbonate shoreline, shelf, flysch, turbidites and pelagic deposits.

AGY 821: Groundwater Hydrology (3 Units)

Hydrologic cycle. Physics of flow through porous media. Equation of continuity. Aquifer characteristics and influence of geological factors. Methods of sinking wells, pumping tests, analyses of borehole data. Saline water intrusions and coastal hydraulics. Groundwater resource systems. Groundwater resources and basins of Nigeria. Hydrogeological mapping and its applications.

Agy 822: Geographic Information Systems (2 Units)

Types of data for a Geographic Information System (GIS): Field geological, borehole, resistivity, seismic, gravity, geochemical, engineering geological, hydrological etc. data formatting on a common co-ordinate system (data planes), vector format, grid format, raster format. Map-oriented and image-oriented GIS. Synergistic interpretation: mineral exploration (correlation of geological and geophysical anomalies), natural hazards (soil erosion earthquakes, floods, landslides etc). Introduction to GIS software (ILWIS, Erdas Images,Arc GIS, Geomedia, etc).

AGY 823: Optical System (3 Units)

Aerial photography: characteristics and principles. Techniques of photogeological interpretation. Multispectral photography and imagery. Manned and unmanned satellite imagery (LANDSAT, SPOT etc). Techniques of imagery interpretation.

AGY 824: Digital Image Processing (2Units)

Image structure and image processing systems. Image restoration and image enhancement. Information extraction strategy. Hardwares and softwares for image processing.

AGY 825: Advanced Engineering Geology (3Units)

Advanced study of the application of geology to civil and mining engineering. Stress, strain and elasticity. Rocks and soils as construction materials and aggregates. Applications of soil parameters to structural designs in foundations. Soil stabilization methods. Engineering geological site investigations for highways, buildings, dams, bridges, surface and subsurface excavations. Engineering geological maps. Ground engineering. Geotextiles, geomembranes.

AGY 826: Geology of Petroleum (3 Units)

Petroleum System: significance of source, migration, reservoir, trap, pool in a petroleum play. Distinction between petroleum pool, field and province. Characteristics of a classic oil and gas province. Surface occurrences of Petroleum: oil exudates, bitumen and sand and oil shale. Occurrences of conventional petroleum. Origin of petroleum: composition and transformation of organic matter. Aspects of source rock petroleum geochemistry. Source rock maturation indices. Primary and secondary petroleum migration. Reservoir characteristics. Reservoir mechanics and energy; secondary recovery. The Niger Delta Oil Province.

AGY 827: Soil Mechanics (2 Units)

Soil identification and classification systems. Soil mineralogy and methods of its determination. Soil physics, specific gravty, bulk density, porosity, permeability and seepage in soils. Phase relationships in soil engineering. Shear strength of soils and its measurement, the concept of effective stresses. Theory of compaction and consolidation of soils, California Bearing Ratio (CBR). Roadside arbonculture. Soil exploration methods. Problems in soil engineering.

AGY 828: Remote Sensing Applications (2 Units)

Applications of remote sensing techniques to the exploration of natural resources – oil, solid minerals, geothermal and

other energy sources; environmental and landuse monitoring – natural hazards: earthquakes, floods, volcanoes, land subsidence and landslides, subsurface coal fires, e.t.c. use of interferometric synthetic aperture radar in hazard monitoring.

AGY 829: Ore Mineralogy (3 Units)

Review of ore mineral types and classes. Methods of identifying ore minerals in hand specimens and their main diagnostic features. Utilization of the reflected light (ore) microscope. Physical and optical properties of ore minerals. Textures and structures of ore minerals. Ore mineral paragenesis.

AGY 830: Environmental Hydrogeology (3 Units)

Distribution of elements and isotopes in groundwater, chemical equilibria in groundwater. Chemical classification and chemical facies of groundwater. Equilibrium constants of water-rock interactions, water-oil interactions. Chemical and biological pollution indices. Theory of groundwater flow and transport systems-flow nets in crystalline and sedimentary rocks. Transport and fate of chemical and biological particles in groundwater.

AGY 832: Foundation Systems (2 Units)

Detailed study of methods of subsurface investigations in soils and rocks for foundation construction. Hydraulic properties of soils and rocks, consolidation characteristics of soils. The different types of foundations for superstructures on rocks and soils. Methods of construction of strip, raft, pile and buoyancy foundations. Buoyancy shafts, retaining walls and abutments. Drainage and stabilization during and after construction. Selection of foundation types: basis for design of foundations and retaining structures. Qualities of a good foundation. Foundation materials. Foundation settlement.

AGY 834: Rock Mechanics (2 Units)

Geological and engineering classification of rocks for construction purposes. Determination of the physical properties and strength parameters of rocks. Failure criteria in rocks. Plastic flow, dislocation, structural and strength anisotropy, porosity and degree of saturation. Stress energy concept. Concepts of shear and tri-axial strengths in discontinuous rock media. Various methods of stability analysis for rock slopes and underground excavations. Methods of laboratory testing of mechanical properties of rocks. Practical applications of the principles of rock mechanics.

AGY 836: Quantitative Hydrogeology (2 Units)

Groundwater flow and transport equations: advection, dispersion and boundary flow equations. Computer and mathematical simulation of groundwater systems. Solution techniques – finite difference and finite element methods. Iteration techniques. Programming of the model equations. Introduction to the use of computer modeling packages e.g. MODFLO.

AGY 838: Clay Mineralogy (2 Units)

Types of clay minerals. Clay mineral structures and their classification: two layer and three-layer types; kaolinite group, smectite (montmorillonite) group, illite group, chlorite group. Properties in relation to structure. Formation of clay minerals. Methods of clay analysis: X-ray diffractometry, flame diffraction analysis, electron microscopy. Clay diagenesis in relation to petroleum genesis and exploration.

AGY 840: Palynology (3 Units)

Definition of palynology and some palynological terms. Morphology: exine of pollen and spores. Systematics in palynology. Deposition and preservation of palynomorphs in sedimentary environments. Sample reliability in palynological analysis. Dinoflagellate cysts, acritarchs, tasmanitids and other organisms associated with palynological periods especially the Cretaceous, Tertiary and Quartenary. Palynofacies analysis. Palynology and thermal maturation studies.

AGY 844: Advanced Geological Mapping (6 Units) Detailed geological mapping of a selected area and submission of a report on it. The work carried out in this course shall be distinct from the Research Project.

AGY 899: Master's Thesis Research Project (12 Units)

Independent geological research project the results of which are presented in the form of a thesis.

C. Doctor of Philosophy

AGY 999: PhD Thesis Research Project in Applied Geology (12 units)

Original research project, which must involve independent geological investigations using state-of-the-art technology in any of the listedfields, should make new and significant contributions to the understanding and knowledge of Applied Geology. The report should be presented in form of a thesis using approved format. Every candidate must present, at least, two successful seminars before submission of PhD thesis report for examination.

LIST OF ACADEMIC STAFF IN APPLIED GEOLOGY DEPARTMENT (AGY)

S/N	NAME	CURRENT STATUS	AREA OF SPECIALIZATION
1.	Prof. O.A. Ademeso	Professor	Engineering Geology and Hydrogeology
2.	Prof. Y.A. Asiwaju-Bello	Professor	Hydrogeology, Engineering Geology
3.	Prof. S.A. Opeloye	Professor	Sedimentary and Petroleum Geology
4.	Prof.. O.S. Ayodele	Professor	Remote Sensing, Structural Geology, Mineral Exploration, Geochemistry
5.	Dr. M.O. Adepoju	Reader	Economic Geology, Geochemistry
6.	Dr. J.O. Owoseni	Senior Lecturer	Hydrogeology, Engineering Geology
7.	Dr (Mrs) O.A. Bamisaye	Senior Lecturer	Remote sensing, Structural Geology
8.	Dr. I.O. Ajigo	Senior Lecturer	Petrology, Geochemistry
.9.	Dr. T.I. Asowata	Senior Lecturer	Environmental Geochemistry
10.	Dr. O.A. Ogbahon	Senior Lecturer	Sedimentary and Petroleum Geology

9.4.2 DEPARTMENT OF APPLIED GEOPHYSICS

1.0 POSTGRADUATE PROGRAMMES

1.1 PROGRAMMES OFFERED

(a) Postgraduate Diploma (PGD) Applied Geophysics

(b) Master of Technology (M. Tech.) in Exploration Geophysics

(c) Doctor of Philosophy (Ph.D.) Exploration Geophysics;

1.2 AVAILABLE OPTIONS/SPECIALIZATION

(a) Petroleum Geophysics

(b) Groundwater/Environmental/Engineering Geophysics

(c) Mining Geophysics.

1.3 PHILOSOPHY AND OBJECTIVES:

The programmes aim at producing the necessary manpower needed for industrial, technological and academic development of the country in high-technology areas that depend on Applied Geophysics for self- reliance. They are also aimed at providing a broad-based training for professional and academic development of the country in the area of Exploration Geophysics.

1.4ADMISSION REQUIREMENTS

(a) Postgraduate Diploma (PGD)

Application for this programme should be:

(i) Holders of first degree in Physics/Earth Sciences or Engineering/Surveying with a minimum of a pass degree from a recognized University.

(ii) Holders of HND with a minimum of Lower Credit in petroleum Engineering, Physics/ Electronics, Electrical/ Electronics, Geology, Mining or Geophysics from any recognized Institution of higher learning.

(iii) Holders of first degree in Education with either Physics or Mathematics as a major-with a minimum of a second class Upper division.

(iv) In exceptional cases, mature students with a minimum of ten years working experience and acceptable professional qualification.

(b) M.Tech

In addition to the general regulations and guidelines on admission, first-degree Graduates of FUTA or any other recognized University (with a minimum of second class, Lower Division) in the following:

(i) Geophysics
(ii) Physics
(iii) Geology (a strong background in Mathematics is desired)
(iv) Engineering Based Courses e.g. Civil and Mining Engineering, etc.
Candidates with a minimum of Upper Credit at the PGD level in Applied Geophysics are also eligible.

(c) PhD

The PhD degree shall normally be by research and specialized course work. Entry conditions shall include a minimum of cumulative 60% in course work and project at the Master's degree level of this University or that of any other recognized institution. In addition, holders of the Master's degree or its equivalent from other institutions may be required to audit and pass some courses that may be prescribed by the Department.

1.5 DURATION OF PROGRAMMES:

(a) Postgraduate Diploma (PGD)

The academic programme, which will be on a part-time basis (week-ends only), includes a course work and a supervised thesis project and both will cover a period of at least three semesters. The project work will be done during the long vacation.

(b) M. Tech.

Full-time; 18 to 24 months. Part-time; 24 to 36 months. Senate may approve an extension where necessary.

(c) Ph. D

Full-time; 36 to 48 months. Part-time; 48 to 60 months. Senate may approve an extension where necessary.

1.6 Requirements for Graduation:

(a) Postgraduate Diploma (PGD)

All students must take and pass all the core courses. All other courses (electives) are mandatory only for non-geologists and non-geophysicists. All other conditions specified by the Federal University of Technology, Akure or by the post Graduate School for the award of PG diploma shall apply. Each candidate will be required to complete and pass a minimum of 45 units which must include 6 units of supervised project.

(b) **M. Tech.**

Prospective Master's Degree graduates are expected to pass all the core courses as well as those under their respective options. They are also to successfully defend the thesis project before the internal and external examiners recommended by the departmental postgraduate Committee and approved by the Postgraduate board/Senate of the university.

(b) Ph. D

All candidates are expected to carry out original research projects supervised by approved postgraduate lecturers and successfully defend same in accordance with the Postgraduate School regulations

1.7 COURSE OUTLINE

(a) Postgraduate Diploma (PGD)

First Semester

COURSE CODE	COURSE TITLE	L T P U
AGP701	Geophysical Time Series	2 0 3 3
AGP703	Electrical Prospecting Methods	2 0 3 3
AGP705	Borehole Geophysics & Radiometric	2 0 3 3
AGP707	Magnetic Prospecting Methods	2 0 3 3
AGP709	Seismic Refraction Methods	2 0 3 3
AGP713	Geophysical Field Work	0 0 3 3
*AGP715	Introductory Geology for Geophysicist 1	3 0 0 3
**AGP717	Introductory Geo-mathematics I	3 0 0 3
	Total	21/24

Restricted Elective

* Not for Geology and Geophysics graduates

** For Geologist

Second Semester

COURSE CODE	COURSE TITLE	L T P U
AGP702	Groundwater/Environmental Geophysics	2 0 3 3
AGP704	Engineering Geophysics	2 0 3 3
AGP706	EM Prospecting Methods	2 0 3 3
AGP708	Seismic Reflection Prospecting Methods	2 0 3 3
AGP712	Geophysical Seminar	0 0 6 2
AGP714	Gravity Prospecting Methods	2 0 3 3
* AGP716	Introductory Geology for Geophysicists 11	2 0 3 3
* AGP718	Introductory Geomathematics II	2 0 3 3
	Total	20/23

Electives

* Not for Geology and Geophysics graduates

** For Geologist

Third Semester

COURSE CODE	COURSE TITLE	L T P U
AGP799	PGD Research Project	- - - 6
	Total	6

(b) (M.Tech.)

First Semester

COURSE CODE	COURSE TITLE	L T P U
AGP801	Electrical Methods	2 0 3 3
AGP803	Geophysical fieldwork	0 0 2 3
AGP805	Research Methodology and Analysis Expt.	2 0 3 3
AGP807	Time Series Analysis and Inversion Theory	2 0 3 3
AGP811	Exploration Seismology	2 0 3 3
AGP815	Advanced Electromagnetic Methods	2 0 3 3
AGP817	Advanced Gravity and Magnetic Methods	2 0 3 3
	*Elective	2 0 3 3
	Total	21/24

Electives

*AGP809Geomathematics II 2 0 3 3

*AGP813Geology for Geophysicists 2 0 3 3

Second Semester

Petroleum Geophysics Option

COURSE CODE	COURSE TITLE	L T P U
AGP802	Seismic Stratigraphy	2 0 3 3
AGP804	Reservoir Geophysics	2 0 3 3
AGP806	Offset-dependent Reflectivity	2 0 3 3
AGP812	Graduate Seminar	0 0 0 1
AGP808	Seismic/Petrophysical Data Analysis and	
Interpretation	2 0 3 3	
AGP814	Health Safety and Environmental Protection	2 0 0 2
	Total	15

COURSE CODE	COURSE TITLE	L T P U
AGP899	Master's Thesis Research Project	- - - 12

Mining Geophysics Option

COURSE CODE	COURSE TITLE	L T P U
AGP820	Mining Exploration and Evaluation Management	2 0 3 3
AGP822	Logging for Mineral Exploration	2 0 3 3
AGP824	Gravimetrics and Magnetic Methods in Mineral Exploration	2 0 3 3
AGP826	Integrated Mineral Exploration	2 0 2 2
AGP828	Environmental Management for Mineral Resources Development	2 0 2 2
AGP830	Tomographic Inversion	1 0 0 1
AGP812	Graduate Seminar	1 0 0 1
	Total	15

COURSE CODE	COURSE TITLE	L T P U
AGP899	Master's Thesis Research Project	- - - 12

Groundwater/Environmental/Engineering Geophysics Option

COURSE CODE	COURSE TITLE	L T P U
AGP832	Advanced Engineering Geophysics	2 0 3 3
AGP834	Advanced Groundwater Geophysics	2 0 3 3
AGP836	Advanced Environmental Geophysics	2 0 3 3
AGP838	Shallow Reflection Seismic/Ground Penetrating	2 0 3 3

	Radar	
AGP812	Graduate Seminar	0 0 0 1
	Total	19

COURSE CODE	COURSE TITLE	L T P U
AGP899	Master's Thesis Research Project	- - - 12

(c) (Ph. D.)

COURSE CODE	COURSE TITLE	L T P U
AGP999	Doctoral Research Project	- - - 12

10.8 COURSE SYNOPSIS

(A) POSTGRADUATE DIPLOMA (PGD)

AGP 701 GEOPHYSICS TIME SERIES ANALYSIS (3 Units) 2 – 0 -3

Fourier Transforms and Waves: Convolution and Spectra; Sampled Data and Z-transforms; Fourier sums; Fourier and Z Transform; Correlation & Spectra. Convolution in the frequency domain; 2-D Fourier Transform; Signs in Fourier Transforms, Examples of 2-D Fourier Transform. Downward Continuation of waves; Dipping waves, Snell's waves, Continuation of Dipping plane waves, Downward continuation with Fourier Transform; Linear Filters and Convolution; Fourier Analysis, Filters in the frequency domain, Cross-correlation and autocorrelation, Deconvolution, Spiking Deconvolution, Dereverberation. Matrix Formulation methods and application to inverse modeling.

AGP 702 GROUNDWATER/ENVIRONMENTAL GEOPHYSICS (3 Units) 2–0 - 3

Application of geophysical methods in groundwater exploration. Aquifer detection in Basement Complex and Sedimentary areas. Geophysical techniques and field procedures used in mapping of geological structures useful to groundwater accumulation. Determination of aquifer characteristics. Relevant Borehole location strategy and case histories. Applications of geophysical techniques in environment pollution studies, saline water intrusion and mapping; determination of chemical pollution at industrial sites and delineation of chemical plumes, oil spillage, pollution and mapping.

AGP 703 ELECTRICAL PROSPECTING METHODS (3 Units) 2 – 0 - 3

Fundamental principles, electrical properties of rocks and ores. Self-potential Earth resistivity. Electric profiling and sounding computations. Interpretation of electric sounding. Electrical mapping and prospecting.

AGP 704 ENGINEERING GEOPHYSICS (3 Units) 2 - 0 - 3

Shallow geophysical techniques for evaluation of engineering parameters; elastic co-efficients, geologic structure, groundwater, seismic hazard, regulatory criteria.

AGP 705 BOREHOLE GEOPHYSICS AND RADIOMETRICS (3 Units) 2 -0 - 3

Concepts of the logging techniques. Electrical logging methods. Resistivity self-potential, Induced polarization, EM, Dipmeter, etc. Porosity logs-sonic, gamma ray, density, neutron logs, etc,: others and applications of geophysical logs in oil and groundwater exploration.

Fundamental principles of radioactivity, nuclear disintegration, radioactive decay processes, radioactivity of rocks and minerals. Instrumentation and data interpretation. Case histories.

AGP 706 EM PROSPECTING METHODS (3 UNITS) 2 – 0 - 3

Classification of EM methods. Amplitude and phase anomalies. Compensator method. Turam method, moving source and receiver methods. Transient induced polarization methods. Magneto-telluric methods. Application in resolving geologic problems.

Classification of electromagnetic methods. Amplitude and phase anomalies, Compensator method. Turam method. Moving source and receiver methods. Transient induced polarization method. Magnetotelluric methods. Application in resolving geological problems.

AGP 707 MAGNETIC PROSPECTING METHOD (3 Units) 2– 0 – 3

Introduction: Potentials; Fundamentals of magnetic dipole interactions with applications to simple mass distributions Gauss theorem, and the field equations. Magnetic instruments and data acquisition. Magnetic data reduction, interpretation of magnetic data and data

adjustments. Interpretation of magnetic anomalies, isolation of anomalies; magnetic dip and depth estimates geologic examples.

AGP 708 SEISMIC REFRACTION PROSPECTING METHOD (3 UNITS) 2–0 - 3

Geophysics and reflected wave paths. Refraction, elastic constants, curved ray theory and applications. Seismic detectors, Field techniques reverse shooting, static and interpretation.

AGP 709 SEISMIC REFLECTION PROSPECTING METHOD (3 Units) 2 – 0 - 3

Oil demand and supply. Exploration activity and the place of Geophysics in Exploration, propagation of seismic waves. Analytical treatment of elementary seismic reflection problem. Field techniques and interpretation of modern seismic reflection section.

AGP712 GEOPHYSICAL SEMINAR (2 Units) 0- 0 - 6

Presentation by class members of material drawn from personal investigation or of material selected from geophysical literature.

AGP 713 GEOPHYSICAL FIELD WORK (3 UNITS) 0 – 0 – 3

An independent geophysical field studies lasting three to four weekends to be undertaken at the end of the first semester. The aim is to expose the students to practical field work. A report on the exercise must be written and submitted for assessment.

AGP 715 INTRODUCTORY GEOLOGY FOR GEOPHYSICISTS I (3 Units) 3–0- 0

Introductory petrology- Rock types, origin, classification, composition and identification. Physical geology-weathering and weathering agents, transportation and deposition. Depositional environments. Basic principles of stratigraphy, stratigraphic terms unconformities, Geological time. Minerals, industrial minerals uses. Introduction to structural geology-fold, faults, fractures, etc. Stress and strain analysis. Geology of petroleum.

AGP 714 GRAVITY PROSPECTING METHODS (3 Units) 2 – 0 - 3

Introduction: Potentials; Theory of attraction and potential with application to simple mass distributions; Theorems of Green and Gauss. The field equations. Green's formulae and equivalent surface layers. Potentials of double distributions, Harmonic functions. Instruments, data acquisition and reduction; regional and residual anomaly separation. Interpretation of gravity anomalies, depth and mass estimates; applications of gravity methods in mineral exploration, groundwater and geologic mapping.

AGP 716 INTRODUCTORY GEOLOGY FOR GEOPHYSICIST II (3 Units) 2 – 0 - 3

Basic map-reading-Type of maps, dip & strike; Geology cross-section. Hydro geology-hydrological and cycle, water table, aquifer and types. Groundwater explorations. Engineering geology-Engineering properties of rocks, geological factors affecting engineering structures, influence of groundwater on engineering structures. Introduction to marine geology-sources of ocean water, structure and hypsography of ocean basins. Introductory photogeology. Geology of Nigeria-basement complex and sedimentary basin.

AGP 717 GEOMATHEMATICS I (3 Units) 2 – 0 - 3

Linear Equations, Non Linear Equations. General Theory of nth Order Linear Equations. Review of Matrices, Basic Theory of Systems of First Order Linear Equations. Inverses, Eigen-value and Eigen-vectors. Power Series. Sequence and Series. Limit, Continuity and differentiability of Functions. Differential Equations of First Order.

AGP 718 GEOMATHEMATICS II (3 Units) 2 – 0 - 3

Solutions of Laplace equations. Solution of Initial Value Problems; Step Functions, Impulse Functions. The Convolution Integral. Harmonic analysis. Kernel and Bessel's Equations. Euler Equations. Regression Analysis. Least Square Fitting Techniques, Taylors's Series. Differential Equations of Second Order.

AGP799 PGD RESEARCH PROJECT (6 Units)

An independent researches project chosen according to student interest and supervised by staff, during the final year. The subject must be related to any aspect of Applied Geophysics and its significance to the

exploration programme of an oil, groundwater, mineral investigation, or Engineering Company.

(b) M.Tech

AGP 801 ELECTRICAL METHODS (3 Units) 2 – 0 - 3

Electrical potential theory, Spontaneous Potential, Induced polarization techniques of geophysical prospecting. Data collection, correction and consideration of specialized interpretation. Application of the electrical methods in geological mapping, mineral exploration, engineering site investigation, groundwater and geothermal energy investigation. Detailed treatment of case histories and class works.

AGP802 SEISMIC STRATIGRAPHY (3 Units) 2 – 0 - 3

Seismic sequence analysis. Depositional unit delineation, correlation of sequences and mapping. Conversion from depth to time of core/sample well data. Seismic fades analysis -Analysis of reflection geometry, continuity, amplitude/frequency and interval velocity. Reflection character analysis: waveform, individual amplitude and frequency. Reconstruction of paleogeography and geologic history. Integration and interpretation of seismic sequence and fades. Play and prospect evaluation: definition, mapping and evaluation of potential reservoirs, source beds and seals for structural and Stratigraphic traps. Stratigraphic modelling - utilisation of seismic amplitude and waveforms contributions of modeling and wave-theory modeling. Qualitative and quantitative stratigraphic correlations. Generation of synthetic seismograms. Synthetic seismograms studies of thin beds.

AGP 803 GEOPHYSICAL FIELD WORK (2 Units) 0 – 0 - 9

A field course of about 10 days in exploration geophysics takes place at the end of the first semester. Each student is expected to work on a given problem using integrated geophysical techniques. A report is expected to be submitted as the end of the course.

AGP 804 RESERVOIR GEOPHYSICS (3 Units) 2 – 0 - 3

Synergistic team approach to reservoir management. Elements of reservoir delineation, description and surveillance. Basic Petrophysics. Technologies of reservoir geophysics: 3-D and 4-D/Time-lapse seismic techniques. Vertical Seismic Profiling (VSP) techniques, cross-well tomography. Borehole logging techniques and interpretation, Geothermics - using temperature in hydrocarbon exploration and gamma ray spectrometry. Case histories.

AGP 805 RESEARCH METHODOLOGY AND ANALYSIS OF EXPERIMENTS

(3 Units) 3 – 0 - 0

Objectives and scope of research. Modeling. Research procedure and material selection. Preparation of reports. Definition of statistical terms. Representation of numerical data. Measures of dispersion. Distribution; binomial, Poisson, normal statistical significance; normal distribution tests, Confidence limit and confidence interval, least significant difference, test, x-test. Regression and correlation. Comparative experiment; replication, randomization, least squares, balance incomplete block design. Factorial experiments.

AGP 806 OFFSET-DEPENDENT REFLECTIVITY (3 Units) 2 – 0 - 2

Introduction - Theory and practise of AVO analysis. Rock properties and petrophysical basis of AVO response. Mathematical principles of AVO. Approximation of Zoeppritz's equations. The Gassmann equation. Assumptions of Gassman equations. Gassmann substitutions and regression. AVO classes and crossplots. AVO attributes- Lambda, Mu and Rho. Attribute maps. Background normal calculations/ intercept and gradient calculations. Inversion of P-wave AVO. Multicomponent AVO. Seismic data processing for AVO and Amplitude variation with angle (AVA) analysis. Interpretation of AVO data- Gas detection. Oil detection, Enhanced Oil Recovery (EOR) monitoring, Lithology identification. Porosity identification. Case histories.

AGP 807 TIME SERIES ANALYSIS AND INVESION THEORY (3 Units) **2 – 0 - 3**

Fourier Transforms and Waves: Convolution and Spectra; Sampled Data and Z-transforms; Fourier sums; Fourier and Z Transform; Correlation & Spectra. Discrete Fourier Transform; Fourier Transform as an invertible Matrix, The Nyquist Frequency, The Comb Function, Undersampled Field Data, Symetries. Convolution in the frequency domain; 2-D Fourier Transform; Signs in Fourier Transforms, Examples of 2-D Fourier Transform. Downward Continuation of waves; Dipping waves, Snell's waves, Continuation of Dipping plane waves, Downward continuation with Fourier Transform; Linking Snell's

waves to Fourier Transforms. Linear Filters and Convolution; Fourier Analysis, Filters in the frequency domain, Cross-correlation a n d autocorrelation,
Deconvolution, Spiking Deconvolution, Dereverberation. Matrix Formulation methods and application to inverse modeling. Practical inversion problems in various geophysical methods.

AGP 808 SEISMIC/PETROPHYSICAL DATA ANALYSIS AND INTERPRETATION (3 Units) 3 – 0 - 0

PC-based 2-D and 3-D seismic data analysis and interpretation. Identification of hydrocarbon indicators and fracture patterns. Generation of seismic attribute maps of horizons and intervals. 3-D grid depth conversion. Synthetic seismograms. Seismic volume rendering and extraction. Multitrace attributes -enhanced structural and stratigraphic interpretation techniques. Fault analysis. Petrophysical modeling. Facies modeling. Log editing. Well correlation. Software development. Seismic ties to well data; Logging tools, synthetic seismograms and tieing well data. Geophysical Interpretation: Quality control of survey and processing, reflection identification, misties and their causes; digitization, map construction, velocity maps and depth conversion, reporting and management presentation. Seismic interpretation exercise; Description of the data, Interpretation of the seismic lines, Features revealed by the seismic data. Geological interpretation: Lithological features of common sedimentary rocks. Depositional features of sedimentary rocks. Deformation mechanisms.

AGP 809 GEOMATHEMATICS II (3 Units) 2 – 0 - 3

Linear Equations, Non Linear Equations. General Theory of nth Order Linear Equations. Review of Matrices, Inverses, Eigen-value and Eigen-vectors. Power Series. Sequence and Series. Limit, Continuity and differentiability of Functions. Differential Equations of First and Second Order. Solutions of Laplace equations. Step Functions, Impulse Functions The Convolution Integral. Harmonic analysis. Kernel and Bessel's Equations. Euler Equations. Regression Analysis. Least Square Fitting Techniques, Taylors's Series.

AGP 811 EXPLORATION SEISMOLOGY (3 Units) 2 – 0 - 3

Fundamentals and basic theory of Seismic waves. Plane and Spherical waves at an interface. 2-layer travel time curves. Multiplayer plane and dipping travel time curves. Refraction across faults. Velocity functions. Estimation of velocity as a function of depth. The Generalized Reciprocal Method (GRM) and depth sections.Static corrections: Elevation and weathering corrections. Uphole survey. Interpretation of refraction field records. Uphole survey and Reflection Seismic.

AGP 812 GRADUATE SEMINAR (1 UNIT) 0 – 0 - 2 Oral presentation describing results of published research work related to Exploration Geophysics. It is normally taken during the last semester of residence before a corresponding graduate degree is awarded.

AGP 813 GEOLOGY FOR GEOPHYSICISTS (3 Units) 2 – 0 - 3

Introduction to the basic principles of stratigraphy. Introduction to structural geology and interpretation for potential of mineral resources. Simple geological structures. Interpretation of folds, faults and fractures. Basic map reading, photogeology and interpretation. Introduction to petrology - igneous, metamorphic and sedimentary rocks. Identification of various rock types and their composition. Industrial minerals and their uses. Petroleum geology: hydrocarbon nature and accumulation. Origin, migration and accumulation of hydrcarbon. Discussion on various traps and salt domes. Basic concepts of Engineering/Hydro-Geology and marine Geology.

AGP 814 HEALTH SAFETY AND ENVIRONMENTAL PROTECTION (2 Units) 2 – 0 - 0

Current policy on environment and applicable laws. Environmental impact assessment (EIA): Principles and practice. Minimum impact approach to oil/gas exploration and exploitation operations. Oil spillage and remediation techniques. Waste management and disposal. Safety principles - safe and unsafe acts. First aid training. Cultural sensitivities. In the areas of operation. Community liaison and crisis management procedure.

AGP 815 ADVANCED ELECTROMAGNETIC METHODS (3 Units) 2 – 0 - 3

Electromagnetic theory. Physical principles of electromagnetic methods. Maxwell's equations. Amplitude and phase anomalies. Classification of electromagnetic methods. Loop and cable methods.

Application of electromagnetic methods in mineral and groundwater exploration.

AGP 817 ADVANCED GRAVITY AND MANETIC METHODS (3 Units) 2 – 0 - 3

Potential field theory. Fundamentals and practical field aspect of land, marine and airborne gravity and magnetic surveying. Interpretation techniques including filtering, continuation two and three dimensional map analysis. Rock magnetism. Resolution of anomalies. Limiting formulae. Gravity and magnetic effects of some simple models. Anomaly characteristics, depth rules. Computation of gravity and magnetic anomalies for irregular bodies. Regional, residual and vertical derivatives. Poisson's relation between gravity and magnetic potential.

AGP 820 MINING EXPLORATION AND EVALUATION MANAGEMENT (3 UNITS) 2 – 0 - 3

Concept of Ore genesis, factors controlling deposition of metallic ores, metallogenic provinces and epochs. Physical and chemical properties, mode of formation and industrial uses of clay, sandstone, evaporites, coal, tar sand etc. Mineral deposits in Nigeria and other parts of the world; Mining methods, choice of mining methods, open-pit and underground mining. Legal Aspect of exploration; Professional guidelines and communication skills; Advance techniques, including estimations recoverable reserves and conditional simulation.

AGP 822 LOGGING FOR MINERAL EXPLORATION (3 UNITS) 2 – 0 - 3

Logging environments; Available types of logs; magnetic field logging; nuclear-magnetic-resonance log; susceptibility log, gravity logging, density log; Impact of digital logging systems; Examination of logging systems not presently used in non-petroleum areas. Qualitative and quantitative use of single and combination measurements; examination of representative logs; Criteria for evaluating and monitoring log quality, Practical problems to illustrate systems and methods.

AGP 824 GRAVIMETRICS AND MAGNETIC METHODS IN MINERAL XPLORATION (3 UNITS) 2 – 0 - 3

Gravimeters and field operations; density data; sources and nature of gravity anomalies; gravity map filtering and contour programs; interpretation using computer modelling; borehole gravimetry. Magnetometers and field operations; magnetic susceptibilities; sources and nature of magnetic anomalies; magnetic map filtering; interpretation using computer modelling; vertical magnetic gradients. Validity of interpretations and quality control; feasibility studies; answer to specific exploration questions; evaluation and critique of results.

AGP 826 INTEGRATED MINERAL EXPLORATION (2 UNITS) 2 – 0 - 2

Variety of targets and detection methods; Base-metal search; Factors affecting exploration work; Combination of integrated geophysical surveys; Airborne surveys; The principal geophysical techniques include, EM, ER, radiometric and seismic methods as applied to mineral exploration. Analyses of examples and problems; Choice of area; Site survey methods; geophysical techniques, interpretation of results.

AGP 828 ENVIRONMENTAL MANAGEMENT FOR MINERAL RESOURCES DEVELOPMENT (2 UNITS) 2 – 0 - 2

Analysis of the existing state; characteristics of the natural environment (geological environment, flora and fauna, morphological data, deposit characteristics, exploration methods, waste disposal sites, needs in water, Environmental problem definition, environmental management requirements; environmental background level; environmental impact analysis; evaluation of the differences among alternative ways of mining and recommendation.

AGP 830 TOMOGRAPHIC INVERSION (1 UNIT) 1 – 0 - 0

Introduction to software and modelling, analysis of geophysical data and application in mineral exploration. The use of computer.

AGP 832 ADVANCED ENGINEERING GEOPHYSICS (3 Units) 2 – 0 - 3

The nature of engineering geophysics as a field. Applicable geophysical methods. Applications of engineering geophysics in engineering site investigations (foundation problems in buildings, roadways, dams etc., location of construction materials, corrosion surveys, dynamic vibration tests of structures, investigation of

earth embankment). Structural Foundations; Types of foundations; Spread footings – bearing pressure, bearing capacity and settlement.Application of electrical resistivity method and its significance in lithology identification. Determination of geoelectric parameters (layer resistivity and thickness) and establishment of depth to bedrock. Relationship between resistivity and soil strength. Engineering applications of seismic refraction method. Relationship between P-wave velocity, S-wave velocity and soil strength. Determination of geo-velocity parameters and elastic coefficients (Poisson's ratio, RQD and rippability). Applications of GPR in engineering site investigations. Geophysical investigations for coastal engineering works. Geotechnical engineering field studies: Field exploration, Groundwater monitoring, Laboratory testing, Analysis of subsurface conditions.

AGP 834 ADVANCED GROUNDWATER GEOPHYSICS (3 UNITS) 2 – 0 - 3

Applications of geophysical methods in groundwater exploration. Aquifer determination in Basement complex and sedimentary areas using electrical and seismic refraction methods. Mapping of geological structures useful to groundwater investigation. Determination of aquifer characteristics. Relevant geophysical techniques and field procedures. Borehole location strategy. Case histories. Coastal saline water intrusion mapping. Delineation of clay stratum in a saline water coastal environment. Delineation of fresh water aquifers in coastal environment.

AGP 836 ADVANCED ENVIRONMENTAL GEOPHYSICS (3 UNITS) 2 – 0 - 3

Scope of environmental geophysics. Objectives of environmental geophysics and the development of appropriate remedial alternatives. Important differences between the applications of geophysics for petroleum/groundwater and their hazardous waste site utility. Remedial Investigation/Feasibility Study requirements. Identification of geophysical methods utilized in environmental site characterisation. Ground penetrating radar, Electromagnetic induction, Electrical resistivity, seismic refraction, Magnetometer surveys. Determination of soil corrosivity, overburden protection capacity, hydraulic conductivity, coefficient of anisotropy and their uses in soil characterization and aquifer protection. Geophysical well logging for evaluating hazardous waste sites: General geophysical well log interpretation. Relative well log responses in selected sediments. Porosity determination. Fracture detection. Water levels. Measuring fluid flow. Logging above the water table (gamma ray, resistivity, neutron-neutron, density). Field recording systems. Explanation of individual measurements (calliper, SP measurements, resistance, density, resistivity and conductivity, acoustic velocity, induced polarization, gamma ray, neutron- neutron, deviation, dipmeter, magnetic susceptibility, acoustic televiewer

AGP 838 SHALLOW SEISMIC REFLECTION &GROUND PENETRATING RADAR (3 UNITS) 2 – 0 - 3

Comparison of shallow and deep seismic reflections. Highlight of the important variations of the physics of the earth between shallow and deep seismic reflections. Energy sources and field techniques. NMO corrections. Optimum window technique in engineering, environmental and groundwater applications with CMP processing. Effects of soil-moisture content on shallow seismic data. Shallow S-wave survey. Operational problems of shallow S-wave survey. Uses of diffractions for delineating near-surface objects and voids. Comparison of SSR with GPR. Applications of shallow 3- D seismic in engineering investigations. Limitations of SSR. Interpretation techniques in shallow seismic reflection and case studies. Application of radiowave methods to rock investigations and historical development of ground penetrating radar (GPR). Theoretical Principles. Instrumentation, field procedure and data presentation. Attributes of GPR. Field operational problems of GPR. Processing and interpretation of GPR data. Applications: Soil investigations, soil surveys and site investigations, survey of sand and gravel resources, peatland investigations; Bedrock Surveys: bedrock mapping, bedrock construction, building stone exploration; Groundwater studies: River and lake investigations; Site Investigations: Roads, railways and bridges; earth dams, landfill areas; Concrete Structures; Municipal engineering; Environmental studies; Archeological and other investigations.

AGP 899 MASTER'S THESIS RESEARCH PROJECT (12 UNITS)

A Dissertation on a subject related to any of Applied Geophysical methods and its significance to the exploration programme of an oil, groundwater, mineral investigation, or engineering company.

SERVICE COURSES IN GEOPHYSICS FOR APPLIED GEOLOGY AND ENGINEERING STUDENTS

AGP841 GRAVITY AND MAGNETIC METHODS (3Units) 2 – 0 - 3

Introduction to Gravity Theory: First principles; importance of lateral density contrast. Anomaly characteristics and their relationship to source parameters. Introduction to Magnetic Theory; first principles. Dipole theory and lateral susceptibility contrast.

Anomaly characteristics and their relationship to source parameters comparison/contrast of magnetics and gravity. Types of gravity and magnetic surveys. Consideration of survey design.Gravity and Magnetic field effects of some simple models. Map interpretations. Identification of structural trends, faults, basement fabric, igneous activity.

AGP 842 SEISMIC PROSPECTING METHODS (3 Units) 2 – 0 - 3

The place of geophysics in Oil Exploration Elastic Constants. Waves Types; refracted and reflected wave paths; curved ray theory. Seismic refraction field techniques and applications.

AGP 843 ELECTRICAL AND ELECTROMAGANETIC METHODS (3 Units) 2 – 0 - 3

Fundamental principles. Electrical properties of rocks and ores. Introduction to Electrical profiling and sounding. Applications to Engineering, Groundwater and Mineral ore. Classification of EM Methods. Amplitude and Phase Anomalies. Compensator Turam Method, moving source and Receiver methods. Applications in Groundwater and mineral prospecting.

AGP 844 GEOPHYSICAL BOREHOLE LOGGING TECHNIQUES (3 Units) 2 – 0 - 3

Fundamentals of log interpretation. Formation parameters and their interrelationships. Electrical logs: spontaneous potential logs, Resistivity logs, Induction logs, Radiometric logs, Acoustic logs, Caliper logs, sonic logs, litho logs, etc. Applications of geophysical logs, oil Gas, Groundwater and Environmental pollution.

c) (Ph. D)

AGP 999 DOCTORAL RESEARCH PROJECT (12 UNITS)

Original research project, which must involve independent geophysical investigations in any of the listed fields, should make new and significant contributions to the understanding and knowledge of Applied Geophysics. The report should be presented in form of a thesis using approved format. Every candidate must present, at least, two successful seminars before submission of PhD thesis report for examination.

LIST OF ACADEMIC STAFF IN APPLIED GEOPHYSICS DEPARTMENT (AGP)

S/N	NAME	STATUS	AREA OF SPECIALIZATION	E-MAIL ADDRESS	PHONE NUMBER
1	Prof. G. M. Olayanju	Professor	Mining Geophysics, Engineering/Environmental/ Groundwater Geophysics	gmolayanju@futa.edu.ng	08035923017
2	Prof. M. T. Olowookere	Professor	Petroleum Geophysics	mtolowokere@futa.edu.ng	09031815090
3	Prof. P. A. Enikanselu	Professor	Petroleum Geophysics	paenikanselu@futa.edu.ng	08036672547
4	Prof. M. I. Oladapo	Professor	Petroleum Geophysics, Engineering/Environmental/ Groundwater Geophysics	mioldapo@futa.edu.ng	08034748381
5	Prof. O. J. Akintorinwa	Professor	Engineering/Environmental/ Groundwater Geophysics	ojakintorinwa@futa.edu.ng	08034968613
6	Prof. J. O. Amigun	Professor	Mining Geophysics, Petroleum Geophysics	joamigun@futa.edu.ng	08035959029
7	Prof. S. Bayode	Professor	Engineering/Environmental/ Groundwater Geophysics	sbayode@futa.edu.ng	08065098153
8	Prof. K. A. N. Adiat	Professor	Engineering/Environmental/ Groundwater Geophysics	kanadiat@futa.edu.ng	08038670332
9	Prof. O. A. Alagbe	Professor	Mining Geophysics, Engineering/Environmental/ Groundwater Geophysics	oaalagbe@futa.edu.ng	08034229080
10	Dr. M. A. Ayuk	Reader	Petroleum Geophysics	maayuk@futa.edu.ng	08035223352
11	Prof. K. A. Mogaji	Professor	Remote Sensing & GIS Modelling, Engineering/Environmental/ Groundwater Geophysics	kamogaji@futa.edu.ng	08106519011
12	Prof. I. A. Adeyemo	Professor	Engineering/Environmental/ Groundwater Geophysics	iaadeyemo@futa.edu.ng	08060042770
13	Dr. B. A. Olisa	Reader	Petroleum Geophysics	baolisa@futa.edu.ng	08069697925
14	Dr. O. Abiola	SL	Petroleum Geophysics	oabiola@futa.edu.ng	08035023164
15	Dr. A. A. Akinlalu,	SL	Mining Geophysics, Engineering/Environmental/ Groundwater Geophysics	aaakinlalu@futa.edu.ng	08034298275
16	Dr. J. S. Abe	SL	Petroleum Geophysics	jsabe@futa.edu.ng	08035652409
17	Dr. (Mrs) B. T. Ojo	LI	Petroleum Geophysics	btojo@futa.edu.ng	08033530758
18	Dr. (Mrs) O. A. Oluwadare	LI	Petroleum Geophysics	oaoluwadare@futa.edu.ng	07066295482

9.4.3 DEPARTMENT OF MARINE SCIENCE AND TECHNOLOGY

CURRICULUM FOR POSTGRADUATE DIPLOMA (PGD) PROGRAMME

1. PROGRAMME OFFERED

Postgraduate Diploma (PGD) in Marine Science and Technology.

2. PROGRAMME PHILOSOPHY

The Postgraduate Diploma (PGD) programme is structured to provide make-up/ conversion/ bridge training for holders of some non-marine science Bachelor's degrees or HND from recognized universities and polytechnics who may desire marine geoscience knowledge and qualification at this level. The programme will also provide advanced theoretical and practical training for earth and mineral scientists who may require a deeper knowledge of marine science and technology in their respective careers.

3. PROGRAMME OBJECTIVES

The PGD in Marine Science and Technology is designed to provide gap-bridging training in Marine Sciences. The specific objectives of the programme are to:

a. Assist practising graduates of physical/ allied sciences/ engineering in coastal and marine science-related fields, to acquire additional knowledge of marine science required in their jobs.
b. Serve as a bridge programme for higher diploma holders in physical and chemical oceanography, relevant earth and chemical sciences.

4. PROGRAMME JUSTIFICATION

Some sub-professionals and non-professionals work in various marine-based establishments and are desirous to undergo advanced Marine Science and Technology training. The programme will boost the manpower requirements in the marine sector of the economy, thereby addressing the shortage of professionals in these fields. In addition, it will prepare graduates for professional certification and academic advancement.

5. ADMISSION REQUIREMENTS

Candudates seeking admission into the Postgraduate Diploma in Marine Science and Technology must possess any of the following:

(a) (i) B.Tech in Marine Science and Technology, B.Tech/B.Sc in Applied Geology/ Geology/ Geoscience/ Earth Sciences, Applied/Exploration Geophysics, Meteorology/Climate Science, Remote Sensing, and Chemistry from a recognized University with a minimum of Third Class degree, or

(ii) Higher National Diploma (HND) with a minimum of Upper Credit in Geology/ Geological Technology, Mineral Resources, Water Resources, Earth Sciences, Chemistry from recognized Monotechnics, Polytechnics or Colleges of Technology; or

(iii) B.Tech with a minimum of Second Class Lower in Physics, Mining and any other related physical/ chemical sciences from FUTA or any recognized universities; and

(a) Five (5) Ordinary Level Credit passes in English Language, Mathematics, Physics, Chemistry and Biology/Geography, and that admission will be subject to availability of vacancies.

6. PROGRAMME DURATION

The PGD programme shall be for a minimum of three semesters on a full-time basis.

7. GRADUATION REQUIREMENTS

To be eligible for the award of Postgraduate Diploma (PGD) in Marine Science and Technology, a candidate shall be required to:

i) pass 43-course units, which must include 6 units of a research project. The assessment of candidates shall be through coursework examination, fieldwork report assessment and Department-based post-field seminar and project writing.
ii) obtain a cumulative weighted average score of a minimum of 50% in the coursework (written

examinations) and a grade of not less than 45% in not more than two courses.

iii) COURSE OUTLINE

FIRST SEMESTER

S/N	Course Code	Title	L	T	P	U
1.	MST 701	Fundamentals of Oceanography	2	0	0	2
2.	MST 703	Geospatial Data Analysis and Interpretations	0	0	3	1
3.	MST 705	Marine Sedimentology and Stratigraphy	2	0	0	2
4.	MST 707	Atmospheric Science	2	0	0	2
5.	MST 709	Marine Electrical Methods	1	0	3	2
6.	MST 711	Ocean Remote Sensing and GIS	2	0	0	2
7.	MST 713	Coastal Geomorphology and Hydrodynamics	2	0	0	2
8.	MST 715	Swimming and Diving Skills	0	0	3	1
		Total				**14**

SECOND SEMESTER

S/N	Course Code	Title	L	T	P	U
1.	MST 702	Biological Oceanography	2	0	0	2
2.	MST 704	Physical Oceanography	2	0	0	2
3.	MST 706	Petroleum Geology and Micropaleontology	2	0	0	2
4.	MST 708	Marine Potential and Seismic Methods	1	0	3	2
5.	MST 710	Chemical Oceanography	2	0	0	2
6.	MST 712	Seafloor Geology	2	0	0	2
7.	MST 714	Marine Geochemistry and Pollution	2	0	0	2
		Total				**14**

THIRD SEMESTER

S/N	Course Code	Title	L	T	P	U
1.	MST 721	Marine Resources and Exploration	2	0	0	2
2.	MST 723	Ocean Modelling	2	0	0	2
3.	MST 725	Integrated Ocean and Coastal Zone Management	2	0	0	2
4.	MST 727	Sea Practical	0	0	6	2
5.	MST 729	Course Seminar	0	0	3	1
6.	MST 799	PGD Research Project	0	0	18	6
		Total				**15**

iv) COURSE SYNOPSES

MST 701: Fundamentals of Oceanography (2 Units)
Geological, chemical, physical, and biological aspects of the ocean; Structure, formation and general morphological features of ocean basins; Seawater properties and their distribution. Characteristics of marine organisms – their main features, general habitat and behaviour; Marine ecological principle. Occurrence, structure and types of volcanoes on the ocean floor. Oceanic ridge systems – varieties, distribution, characteristic structures and features. Magma types and Lava flows on the seafloor. The structure, physics, dynamics and thermodynamics of the atmosphere; Weather – major natural and artificial factors influencing weather, transient and steady conditions; Weather-forecasting; Climate and climate change. Climate-related & Weather-related phenomena such as hurricanes, severe storms, global warming, and acid rain – their causes and effects.

MST 702: Biological Oceanography (2 Units)
The ecology of marine systems with an emphasis on the interactions between organisms in biological communities and the environment. The physical setting and ecological organization of the communities found in the rocky intertidal, in the fouling habitat, on sandy beaches, in subtidal soft bottoms, coral reef and the deep sea. Ecology of marine micro and macro-zooplankton. Hydrothermal vent discharges and deep-sea communities. Marine plants and animals: classification, structure, physiology, ecology and adaptations to the marine environment. Marine nekton, including bony and cartilaginous fishes, cephalopods, reptiles and mammals. Biological oceanography in the molecular era. Ecological geography of the ocean. Upwelling food webs and microbial processes. Climate change effects on marine organisms. Paleoceanographic proxies for ocean production (Relationship between Paleobiology, paleoecology and palaeoclimatology).

MST 703: Geospatial Data Analysis and Interpretations (1 Unit)
Theoretical and practical planning, implementation of data collection and analysis of the marine environment. Techniques include measuring geological, chemical, biological and physical oceanographic properties in space and time. Statistical techniques of spatial data analyses with computer applications in different map productions for coastal and marine environments: contour (topographic), isocon, isotherm, isobar, isovel, etc maps. Application of suitable computer graphic software for map production in 2D, 3D and 4D. Recognition of seafloor and coastal features on maps: ocean ridges and lava features, estuaries, etc. Construction of profiles and panel diagrams of the ocean floors and their interpretations.

MST 704: Physical Oceanography (2 Units)
Ocean dimensions; physical properties of seawater. Water masses of the ocean and forces acting in the ocean. Air-Sea interaction: Walker circulation. Solar Radiation, Net Back Radiation, Conduction and Convection and latent heat release. Hydrostatic and geostrophic balance; circulation and vorticity. Rossby and Ekman numbers. Geostrophic currents – barotropic and baroclinic mass transports. Specific heat and thermal conductivity of seawater: heat sources and exchanges; ocean heat budget; The El Nino and ENSO.

MST 705: Marine Sedimentology and Stratigraphy (2 Units)
Origin of sediments: structure and composition of the Earth from core to crust. Surface processes- weathering, erosion, transportation, sedimentation and evolution of landforms. Agents of erosion and deposition. Ocean processes- turbidity currents and turbidites. Sedimentary rock and processes; Depositional environments; Sedimentary structures and analysis of paleo-current data; categories of sedimentary rocks; Techniques for studying subsurface strata concerning oil, gas, water and mineral exploration; Petrographic study of sedimentary rocks; Mineral separation techniques. Concepts of chrono-, litho-, biostratigraphy, magnetostratigraphy and stratotypes. Stratigraphic classification, terminology and correlation; Establishment of biostratigraphy through interval, assemblage and abundance zones; Facies concept and facies analysis; Origin and evolution of sedimentary basins; Concept of sequence stratigraphy; Data analyses and graphical representation.

MST 706: Petroleum Geology and Micropaleontology (2 Units)
Morphology, classification, biostratigraphy and geological history of major groups of microfossils, especially Foraminifera, Ostracoda and Conodonts. Paleoecology and current scheme of classification. Applied micropaleontology. Origin, migration and accumulation of hydrocarbon. Source rock characteristics and maturation scheme. Reservoir rocks and traps. Subsurface maps. Well logs, seismic data acquisition, processing and interpretation. Evaluation of petroleum potentials and reserves. Oil and gas wells: drilling, completion and production. Global oil reserves. Oil deposits in Nigeria. Oil and geopolitics.

MST 707: Atmospheric Science (2 Units)
Basic composition and chemistry of the atmosphere – chemical zonation and mixing in the atmosphere; Chemical processes involved in local and regional air pollution; and acid rain; Global change in the composition and climate of the atmosphere; stratospheric ozone, and global warming. Chemical kinetics; mechanisms

controlling the abundance of stratospheric ozone. Anthropogenic perturbations on the oxidizing capacity of the atmosphere. Atmospheric variables in time and space: moisture variables- mixing ratio, specific humidity, etc. Pressure systems, pressure gradient and Coriolis force. Atmospheric motion: geostrophic, gradient and thermal wind. Lapse rates environment, dry and wet adiabatic lapse rates. Types and characteristics of atmospheric stability. The solar system, solar radiation and the Earth's atmosphere.

MST 708: Marine Potential Field and Seismic Methods 2 Units)

Gravity data reduction; Regional, residual anomaly separation. Interpretation of gravity anomalies; Dead and total mass estimates. Application of gravity method in the ocean floor and deep-sea explorations. Fundamentals of magnetic dipole interactions with applications to simple mass distributions**,** Gauss Theorem. Instrumentation and data acquisition procedures. Reduction of magnetic data. Anomaly separation and interpretation. Air-borne and sea-borne magnetic surveys. Data acquisition and Interpretation. Application of magnetic methods in the ocean floor and deep-sea explorations. Field techniques, processing and interpretation of modern seismic refraction sections, static correction charts. Propagation of seismic waves. Analytical treatment of elementary seismic reflection problems. Oil exploration in the deep sea: field techniques; processing and interpretation of seismic reflection sections, NMO charts.

MST 709: Marine Electrical Methods (2 Units)

Electrical exploration methods in coastal and marine environments: fundamentals, instrumentation, field procedure, computation, interpretation and applications. Laboratory and fieldwork involving mapping and modelling of the dynamics of coastal hydraulics. Classification of electromagnetic methods. Amplitude and phase anomalies. Compensator method; Turam method. Moving source and receiver methods. Transient induced polarization method. Magnetotelluric methods. Application in resolving geological problems.

MST 710: Chemical Oceanography (2 Units)

Ocean-Atmosphere Chemical Interaction System. Effect of water on the earth's atmosphere. Transfer Processes. The Sea-Atmosphere Interface. Box Models; Geochemical mass balance: dissolved chemical inflow and outflow from the ocean, chemical residence times. Geochemical Cycles-Marine Nitrogen cycle; Marine Oxygen cycle; Marine Carbon cycle: Carbon exchange between the ocean and atmosphere; Marine carbon chemistry and ocean acidification. Chemistry of the oceans. Descriptive chemical oceanography of the components of ocean waters (metals, gases, organic compounds and nutrients). Chemical processes occurring in marine and estuarine waters and their impact on the near-shore and oceanic environments. Diversity of chemical nature and processes of marine sediments; Radiometric dating involving environmental and mineral-based isotopes. Stable isotopes as water mass tracers. Biogeochemical cycles in oceanic systems.

MST 711: Ocean Remote Sensing and GIS (2 Units)

Definition of Ocean Remote Sensing, Satellite ocean remote sensing, scientific significance of ocean remote sensing, Satellite ocean remote sensing system, and Main progress of ocean remote sensing; Fundamentals of Ocean Remote Sensing: Electromagnetic Radiation (EMR) and The Electromagnetic Spectrum, Satellite Orbits, Imaging and Scanning techniques, Resolution of satellite remote sensing; Visible/Infrared Remote Sensing: Satellite sensors and infrared radiometers. Principle of visual interpretation of aerial photographs and satellite imageries; Recognition of elements and interpretation keys; Multispectral, thermal and radar imageries; Link between remote sensing and GIS; Components and functions of GIS; Data sources, gathering and treatment; Data integration overlay concept, multi-temporal data merging, change detection and multi-sensor image merging. Application of remote sensing and GIS in monitoring and management of the coastal and marine environment. SLAR and Radar data.

MST 712: Seafloor Geology

(2 Units)

Morphology of ocean basins and margins. Effects of waves and currents on sediment transport to seafloor: role of grain size, velocity and geologic events. Deep-Sea Sediments- Patterns, Processes, and Stratigraphy. Imprint of climatic zonation on marine sediments.

Ophiolite Complexes. Rare seafloor formations: mud volcanoes, subsea geysers, submarine slides, sea caves, seafloor craters and undersea explosions. Geology and geochemistry of the oceanic crust. Structural and oceanographic setting of continents and ocean basins. Configuration and structures of the ocean floor, emphasizing on fractures and fault systems – their occurrence, distribution and geological significance. Hydrothermal vents – types, occurrence, distribution and ecological significance. Plate tectonics and ocean history.

MST 713: Coastal Geomorphology and Hydrodynamics (2 Units)

Coastal zone-definition, concepts and issues. Dynamics of wind-driven coastal flow. The physical processes at the land-sea interface, including estuaries, beaches and deltas. Water waves, tides, storm surge, sea level, sediment transport, beaches, circulation and mixing. Elements of coastal geomorphology, temporal-spatial dynamics of coastal landforms, coastal landform analysis, shoreline changes. General properties of waves; continental shelf and coastal-trapped waves; illustrations of how ocean variability can be described by free and forced waves. Swells and tides Ocean currents and circulation. Forced and unforced equatorial ocean waves, reflection of equatorial waves from ocean boundaries, equatorial currents, Southern Oscillation dynamics.

MST 714: Marine Geochemistry and Pollution (2 Units)

Geochemical classifications of elements. Processes controlling elemental cycling between the earth's crust, oceans, and atmosphere; Processes involved in the occurrence and transformation of organic substances in the marine environment. The role of marine microbes in geological and geochemical processes. Marine geochemical mapping principles. Pollutants in the marine environment e.g., crude oil, plastics, etc. Effects and remediation methods. Geochemical activities involved in the transformation of pollutants in the ocean. Transport paths and effects of contaminants on marine environments. Biological and ecological changes in the marine environment. Measurement of chemical and biological pollutants. Marine pollution mitigation techniques. Establishment of international standard methods of sampling, sample preparation, and analysis for priority pollutants; methods of ultra-micro chemical analysis.

MST 715: Swimming and Diving Skills (1 Unit)

Basic materials and principles of swimming. Different swimming and diving techniques. Sea-based sessions.

MST 721: Marine Resources and Exploration (2 Units)

Human use of the marine environment, including physical, chemical, biological and geological resources; maricultural resources like molluscs, crustaceans, etc. Marine minerals: – fossil-derived, chemically-precipitated and minerals within the oceanic crust. Energy resources of seawater: - chemical and fossil-derived, wave and tide energies and other sources of kinetics in the ocean. Resources from the ocean floor: Types, economic background, origin, location, and present exploration methods. Mineralization in the oceans: hydrothermal mineral deposits, manganese nodules, phosphorites, etc. The role of microorganisms in the economy and productivity of the sea. The use of coastal lands and waste disposal in the sea. Historical background of deep-sea exploration. Instrumentation for exploration; Sound Navigation and Ranging (SONAR); Oceanographic submersibles. Modern techniques of investigating the physical, chemical and biological conditions at the bottom of the ocean for scientific and commercial purposes. Application of seismic reflection and refraction techniques; Direct drilling and recovered core sample analyses.

MST 723: Ocean Modelling (2 Units)

Basic equations for modelling physical and chemical processes in the atmosphere and oceans. Discretization and numerical approximations for the solution of the relevant differential equations. Parameterizations of sub-grid processes. Atmospheric, oceanic and coupled atmospheric-oceanic models. Analysis of implications and limitations of model results, and comparison of observations. Analysis of atmospheric measurements with an existing model or developing a simple computer model of a particular process. Existing global models, such as a stratospheric two-dimensional model, stratospheric/tropospheric three-dimensional chemistry-transport model, and climate models. Implications of

model results to an assessment of policy alternatives; ozone depletion potentials and global warming potentials.

MST 725: Integrated Ocean and Coastal Zone Management (2 Units)

The Coastal zone: Importance of coastal zone and the need for management. Concept of sustainability. Processes for sustainable management of the coast. Integrated approach and coastal management framework. Dynamic, multidisciplinary and iterative processes of information collection, planning, decision making, management and monitoring of implementation. Balancing environmental, economic, social, cultural and recreational objectives within limits set by natural dynamics. Concept of territorial and international waters. Federal and International policies on marine resource exploration and exploitation. National and international regulations on the usage of the marine environment, e.g., for waste disposal, industrial and recreational activities, etc. United Nations Law of the Sea Convention (UNCLOS).

MST 727: Sea Practical (2 Units)

A field-based course for 3 continuous weeks will be spent on a suitable Island to take measurements, collect and process samples and do analyses. This will be based along the West African coast, preferably anywhere that is directly sandwiched between the lagoon and the open sea. A variety of oceanographic settings will be studied using physical, chemical, geological, geophysical and biological oceanographic techniques. Students will have the opportunity to conduct oceanographic and meteorological measurements at sea and also to collect water, sediment and biological samples for laboratory study or analysis and do mapping of the coastal environment. Field observation of sediment deposition at the coast. Measurement and classification of waves and tides.

MST 729: Course Seminar (1 Unit)

Literature study and oral presentation of a topic on an aspect of the area of oceanography different from the area of the student's research project. A bind report will be submitted.

MST 799: PGD Research Project (6 Units)

Students will research their areas of interest and will be supervised by relevant members of staff. The subject of study must be related to oceanography and involve field-based or secondary data from reputable sources.

PROPOSED CURRICULUM FOR MASTER OF TECHNOLOGY (M.TECH.) PROGRAMME

1. PROGRAMME OFFERED AND AVAILABLE OPTIONS

Master of Technology (M.Tech.) in Marine Science and Technology.

Available Options:

(a) Chemical Oceanography
(b) Marine and Coastazl Environmental Science
(c) Geological Oceanography
(d) Marine Geophysics
(e) Physical Oceanography

2. PROGRAMME PHILOSOPHY

The Master of Technology (M.Tech.) in Marine Science and Technology is designed to provide advanced theoretical and practical training in the application of Marine Science to harness mineral resources, and delineation and assessment of hazardous materials in the coastal environment, while adding to the scientific understanding of the Earth. The programme also involves studying interactions between the atmosphere and ocean, and influences on climate. The programme would provide candidates with a unique opportunity to develop practical scientific experience at sea, together with a rigorous academic curriculum. The candidates will study a range of topics, such as the physicochemical properties of the sea, structure of the seafloor, the nature of the Earth's crust, fossil and renewable energy sources, marine pollution and control, dynamics of the oceans, ocean acidification, coastal and marine geotechnics, and coastal evolution and processes. On completion of the programme, the candidates will be awarded M.Tech. degree in Marine Science and Technology, with a speciality in the options.

3. PROGRAMME OBJECTIVES

The aim of the Master of Technology in Marine Science and Technology programmes is to contribute to high-level manpower development in the public and private sectors.

The specific objectives of the programme are to:

(i) expose the candidates to current research and up-to-date methodologies in Marine Science and Technology and enhance their conceptual understanding of the applications of research methodologies in solving marine-related problems.

(ii) aid capacity building in Marine Science and Technology for the sustenance of teaching and research in institutions of higher learning and other related establishments.

produce professional with long-lasting solutions to modern-day coastal and marine environmental challenges expertise relevant to the public and private institutions and non-governmental organizations.

4. PROGRAMME JUSTIFICATION

There are several issues of global concern that influence the coastal and marine systems. These issues include global climate change, marine pollution, erosion, sustainability, and conservation. With a larger percentage of the Earth's surface (over 70%) covered by water, the health of the world's oceans and lakes is critically important for sustaining life. In addition, the mineral resources in the ocean are much more abundant than what is available on land. Furthermore, activities on the ocean floor most times determine what happened on land. Thus, marine scientists are expected to identify, control, and manage marine challenges and alleviate potential future problems. These disciplines are often interrelated, thereby presenting unique areas of specialization and wide-range career opportunities. Hence, the Master of Technology degree programme is designed to train experts and professionals who can address several marine-related issues aforementioned.

5. ADMISSION REQUIREMENTS

Any applicant seeking admission into the M.Tech. in Marine Science and Technology must possess any of the following:

(a) B.Tech. in Marine Science and Technology, B.Tech./ BSc in Applied Geology/ Geology/ Geoscience/ Earth Sciences, Applied/ Exploration Geophysics, Meteorology/ Climate Science, Remote Sensing, and Chemistry from a recognized University with a minimum of Second Class Lower Division, or

(b) HND at Upper Credit from recognized Polytechnics plus a PGD in Marine Science and Technology from FUTA with a minimum of Upper Credit; and

(iii) Five (5) Ordinary Level credit passes in English Language, Mathematics, Physics, Chemistry and Biology/Geography.

6. PROGRAMME DURATION

The M.Tech. in Marine Science and Technology programme shall run for a minimum of 18 months and a maximum of 24 months on a full-time basis.

7. GRADUATION REQUIREMENTS

To be eligible for the award of MTech, in Marine Science and Technology, candidates will be required to:

a) Pass all prescribed courses offered in both the first and second semesters (a minimum of 46 to 48 credit units- depending on the option). This requirement includes 12 units of a research project..

b) i) Conduct a prescribed field-based project work in a specialized area and submit the required number of copies of the thesis for examination.

ii) Present a proposal seminar before the commencement of project work and another one on completion of the project

iii) Successfully defended their research thesis at an oral examination organized by the department as approved by the School of Postgraduate Studies

iv) Submit the required number of copies of the corrected thesis after examination.

c) Fulfilling other conditions as prescribed by the School of Postgraduate Studies

8. COURSE OUTLINE

A. CHEMICAL OCEANOGRAPHY OPTION

FIRST SEMESTER

S/N	Course Code	Type	Title	L	T	P	U
1.	MST 801	C	General Oceanography	2	0	0	2
2.	MST 803	C	Applied Geospatial Data Analysis	2	0	0	2
3.	MST 805	C	Applied Ocean Remote Sensing and GIS	2	0	0	2
4.	MST 807	C	Computational Methods in Oceanography	2	0	0	2
5.	MST 809	R	Advanced Chemical Oceanography	2	0	0	2
6.	MST 811	R	Seafloor Petrology and Geochemistry	2	0	0	2
7.	MST 813	R	Advanced Coastal Geomorphology and Hydrodynamics	2	0	0	2
8.	MST 815	R	Ocean Waves and Ocean Dynamics	2	0	0	2
			Total				**16**

SECOND SEMESTER

S/N	Course Code	Type	Title	L	T	P	U
1.	MST 802	C	Integrated Ocean and Coastal Zone Management	2	0	0	2
2.	MST 804	C	Diving	0	0	3	1
3.	MST 806	C	Advanced Marine Resources and Exploration	2	0	0	2
4.	MST 808	R	Advanced Physical Oceanography	2	0	0	2
5.	MST 810	R	Marine Pollution and Control	2	0	0	2
6.	MST 812	R	Marine Isotopy	2	0	0	2
7.		E*		2	0	0	2
			Total				**13**

E minimum of at least 2 units*

Elective Courses For Chemical Oceanography Option (minimum of 2 units)

S/N	Course Code	Title	L	T	P	U
1.	MST 814	Coastal Ecology and Biodiversity	2	0	0	2
2.	MST 816	Coastal Geohazards	1	0	0	1
3.	MST 818	Applied Marine Ecology	2	0	0	2

THIRD SEMESTER

S/N	Course Code	Title	L	T	P	U
1.	MST 831	Seminars on Oceanography	0	0	6	2
2.	MST 833	Sea Practical	0	0	9	3
3.	MST 835	Graduate Internship	0	0	3	1
4.	MST 899	Master Dissertation	0	0	36	12
		Total				**18**

MARINE AND COASTAL ENVIRONMENTAL SCIENCE OPTION

FIRST SEMESTER

S/N	Course Code	Type	Title	L	T	P	U
1.	MST 801	C	General Oceanography	2	0	0	2
2.	MST 803	C	Applied Geospatial Data Analysis	2	0	0	2
3.	MST 805	C	Applied Ocean Remote Sensing and GIS	2	0	0	2
4.	MST 807	C	Computational Methods in Oceanography	2	0	0	2
5.	MST 813	R	Advanced Coastal Geomorphology and Hydrodynamics	2	0	0	2
6.	MST 815	R	Ocean Waves and Ocean Dynamics	2	0	0	2
7.	MST 817	R	Advanced Marine Sedimentology and Stratigraphy	2	0	0	2
8.		E*		2	0	0	2
			Total				**16**

E minimum of at least 2 units*

Elective Courses For Marine and Coastal Environmental Science Option (minimum of 2 units)

S/N	Course Code	Title	L	T	P	U
1.	*MST 809	Advanced Chemical Oceanography	2	0	0	2
2.	MST 811	Seafloor Petrology and Geochemistry	2	0	0	2
3.	**MST 821	Marine Geophysical Methods	2	0	0	2

* = prerequisite for MS T 8 1 0 (Marine Pollution and Pollution Control)

** = prerequisite for MS T 8 2 2 (Marine G eophysical Data Interpretation)

SECOND SEMESTER

S/N	Course Code	Type	Title	L	T	P	U
1.	MST 802	C	Integrated Ocean and Coastal Zone Management	2	0	0	2
2.	MST 804	C	Diving	0	0	3	1
3.	MST 806	C	Advanced Marine Resources and Exploration	2	0	0	2
4.	MST 808	R	Advanced Physical Oceanography	2	0	0	2
5.	MST 816	R	Coastal Geohazards	1	0	0	1
6.	MST 820	R	Coastal and Marine Foundation Systems	2	0	0	2
7.		E*		2	0	0	2
			Total				**12**

E minimum of at least 2 units*

Elective Courses For Marine and Coastal Environmental Science Option (minimum of 2 units)

S/N	Course Code	Title	L	T	P	U
1.	*MST 810	Marine Pollution and Pollution Control	2	0	0	2
2.	MST 814	Coastal Ecology and Biodiversity	2	0	0	2
3	MST 818	Applied Marine Ecology	2	0	0	2
4.	**MST 822	Marine Geophysical Data Interpretation	2	0	0	2

*MST 8 0 9 (A dvanced Chemical Oceanography) is prerequisite

**MST 8 2 1 (Marine G eophysical Methods) is prerequisite.

THIRD SEMESTER

S/N	Course Code	Title	L	T	P	U
1.	MST 831	Seminars on Oceanography	0	0	6	2
2.	MST 833	Sea Practical	0	0	9	3
3.	MST 835	Graduate Internship	0	0	3	1
4.	MST 899	Master Dissertation	0	0	36	12
		Total				**18**

GEOLOGICAL OCEANOGRAPHY OPTION

FIRST SEMESTER

S/N	Course Code	Type	Title	L	T	P	U
1.	MST 801	C	General Oceanography	2	0	0	2
2.	MST 803	C	Applied Geospatial Data Analysis	2	0	0	2
3.	MST 805	C	Applied Ocean Remote Sensing and GIS	2	0	0	2
4.	MST 807	C	Computational Methods in Oceanography	2	0	0	2
5.	MST 811	R	Seafloor Petrology and Marine Geochemistry	2	0	0	2
6.	MST 813	R	Advanced Coastal Geomorphology and Hydrodynamics	2	0	0	2
7.	MST 817	R	Advanced Marine Sedimentology and Stratigraphy	2	0	0	2
8.	MST 821	R	Marine Geophysical Methods	2	0	0	2
			Total				**16**

SECOND SEMESTER

S/N	Course Code	Type	Title	L	T	P	U
1.	MST 802	C	Integrated Ocean and Coastal Zone Management	2	0	0	2
2.	MST 804	C	Diving	0	0	3	1

3.	MST 806	C	Advanced Marine Resources and Exploration	2	0	0	2
4.	MST 816	R	Coastal Geohazards	1	0	0	1
5.	MST 822	R	Marine Geophysical Data Interpretation	2	0	0	2
6.	MST 826	R	Marine Geodynamics	2	0	0	2
7.	MST 828	R	Micropaleontology	2	0	0	2
8	MST 830	R	Petroleum Geology and Formation Evaluation	2	0	0	2
9.		E*		2	0	0	2
			Total				**16**

E minimum of at least 2 units*

Elective Courses for Marine Geology Option (minimum of 2 units)

S/N	Course Code	Title	L	T	P	U
1.	MST 814	Coastal Ecology and Biodiversity	2	0	0	2
2.	MST 810	Marine Pollution and Pollution Control	2	0	0	2
3.	MST 812	Marine Isotopy	2	0	0	2
4.	MST 820	Coastal and Marine Foundation Systems	2	0	0	2

THIRD SEMESTER

S/N	Course Code	Title	L	T	P	U
1.	MST 831	Seminars on Oceanography	0	0	6	2
2.	MST 833	Sea Practical	0	0	9	3
3.	MST 835	Graduate Internship	0	0	3	1
4.	MST 899	Masters Dissertation	0	0	36	12
		Total				**18**

D. MARINE GEOPHYSICS OPTION

FIRST SEMESTER

S/N	Course Code	Type	Title	L	T	P	U
1.	MST 801	C	General Oceanography	2	0	0	2
2.	MST 803	C	Applied Geospatial Data Analysis	2	0	0	2
3.	MST 805	C	Applied Ocean Remote Sensing and GIS	2	0	0	2
4.	MST 807	C	Computational Methods in Oceanography	2	0	0	2
5.	MST 819	R	Advanced Marine Electrical Resistivity Methods	2	0	0	2
6.	MST 823	R	Advanced Marine Gravity and magnetic Methods	2	0	0	2
7.	MST 825	R	Advanced Marine Seismology	2	0	0	2
8.		E*		2	0	0	2
			Total				**16**

E minimum of at least 2 units*

Elective Courses for Marine Geophysics Option (Minimum of 2 units)

S/N	Course Code	Title	L	T	P	U
1.	MST 811	Seafloor Petrology and Geochemistry	2	0	0	2
2.	*MST 813	Advanced Coastal Geomorphology and Hydrodynamics	2	0	0	2
3.	**MST 817	Advanced Marine Sedimentology and Stratigraphy	2	0	0	2

* = prerequisite for MST 816 (Coastal Geohazards)
** = prerequisite for MS T 830 (Petroleum Geology and Formation Evaluation)

SECOND SEMESTER

S/N	Course Code	Type	Title	L	T	P	U
1.	MST 802	C	Integrated Ocean and Coastal Zone Management	2	0	0	2
2.	MST 804	C	Diving	0	0	3	1
3.	MST 806	C	Advanced Marine Resources and Exploration	2	0	0	2
4.	MST 824	R	Marine Geophysical Data Processing	0	0	6	2
5.	MST 826	R	Marine Geodynamics	2	0	0	2
6.	MST 832	R	Advanced Marine Electromagnetics Methods	2	0	0	2
7.		E*		2	0	0	2
			Total				**13**

E* minimum of at least 2 units

Elective Courses for Marine Geophysics Option (minimum of 2 units)

S/N	Course Code	Title	L	T	P	U
1.	*MST 816	Coastal Geohazards	1	0	0	1
2.	MST 820	Coastal and Marine Foundation Systems	2	0	0	2
3.	**MST 830	Petroleum Geology and Formation Evaluation	2	0	0	2

*MST 813 (Advanced Coastal Geomorphology and Hydrodynamics) is prerequisite.
**MST 817 (Advanced Marine Sedimentology and Stratigraphy) is prerequisite.

THIRD SEMESTER

S/N	Course Code	Title	L	T	P	U
1.	MST 831	Seminars on Oceanography	0	0	6	2
2.	MST 833	Sea Practical	0	0	9	3
3.	MST 835	Graduate Internship	0	0	3	1
4.	MST 899	Masters Dissertation	0	0	36	12
		Total				**18**

E. PHYSICAL OCEANOGRAPHY OPTION

FIRST SEMESTER

S/N	Course Code	Status	Title	L	T	P	U
1.	MST 801	R	General Oceanography	2	0	0	2
2.	MST 803	R	Applied Geospatial Data Analysis	2	0	0	2
3.	MST 805	R	Applied Ocean Remote Sensing and GIS	2	0	0	2
4.	MST 807	R	Computational Methods in Oceanography	2	0	0	2
5.	MST 839	C	Principles of Physical Oceanography	2	0	0	2
6.	MST 841	C	Global Climate Cycles	2	0	0	2
7.	MST 843	C	Ocean Circulation Observations	2	0	0	2
8.	MST 815	C	Ocean Waves and Ocean Dynamics	2	0	0	2
			Total				**16**

SECOND SEMESTER

S/N	Course Code	Status	Title	L	T	P	U
1.	MST 836	R	Dynamics of the Ocean and Atmosphere	2	0	0	2
2.	MST 804	R	Diving	0	0	3	1
3.	MST 808	C	Advanced Physical Oceanography	2	0	0	2
4.	MST 834	C	Geophysical Fluid Dynamics	2	0	0	2
5.	MST 838	C	Marine Hydrology and Forecasting	2	0	0	2
6.	MST 840	C	Descriptive Physical Oceanography	2	0	0	2
7.	MST 842	C	Numerical Analysis of Wave and Wind Climate in Oceanic Basins	2	0	0	2
8.		E*	Elective(s)				2
			Total				**15**

E* minimum of at least 2 units

Elective Courses for Physical Oceanography Option (minimum of 2 units)

S/N	Course Code	Title	L	T	P	U
1.	MST 814	Coastal Ecology and Biodiversity	2	0	0	2
2.	MST 816	Coastal Geohazards	1	0	0	1
3.	MST 818	Applied Marine Ecology	2	0	0	2

THIRD SEMESTER

S/N	Course Code	Title	L	T	P	U
1.	MST 831	Seminars on Oceanography	0	0	6	2
2.	MST 833	Sea Practical	0	0	9	3
3.	MST 835	Graduate Internship	0	0	3	1
4.	MST 899	Master's Thises	0	0	36	12
		Total				**18**

9. COURSE SYNOPSIS

MST 801: General Oceanography (2 Units)
Geological, chemical, physical, and biological aspects of the ocean; Structure, formation and general morphological features of ocean basins; Morphology of ocean basins and margins. Seawater properties and their distribution. Characteristics of marine organisms; Marine ecological principle. Effects of waves and currents on sediment transport: role of grain size, velocity and geologic events. Deep-Sea Sediments. Imprint of climatic zonation on marine sediments. Occurrence, structure and types of oceanic volcanoes. Oceanic ridge systems. Magma types and Lava flows. The structure, physics, dynamics and thermodynamics of the atmosphere; Major natural and artificial factors influencing weather; Weather-forecasting; Climate and climate change. Climate-related & Weather-related phenomena.

MST 802: Integrated Ocean and Coastal Zone Management (2 Units)
The Coastal zone: Importance of coastal zone and the need for management. Concept of sustainability. Processes for sustainable management of the coast. Integrated approach and coastal management framework. Dynamic, multidisciplinary and iterative processes of information collection, planning, decision making, management and monitoring of implementation. Balancing environmental, economic, social, cultural and recreational objectives within limits set by natural dynamics. Integration of terrestrial and marine components of target territory. Constraints of coastal zone management. Concept of territorial and international waters. Sources of International Law and International Conventions; Marine Resources and Environmental Law; Maritime zones. The 1982 UNCLOS; Coastal zone and regulation. Policy and regulation for sustainable development; International Laws and conventions. Climate Change adaptation. Coastal erosion.

MST 803: Applied Geospatial Data Analysis (2 Units)
Theoretical and practical planning and implementation of data collection and analysis of the marine environment. Techniques include measuring geological, chemical, biological and physical oceanographic properties in space and time. Statistical techniques of spatial data analyses with computer applications in different map productions for coastal and marine environments: contour (topographic), isocon, isotherm, isobar, isovel, etc. Application of suitable computer graphic software for map production in 2D, 3D and 4D. Recognition of seafloor and coastal features on maps: ocean ridges and lava features, estuaries, etc. Construction of profiles and panel diagrams of the ocean floors and their interpretations. Curve fitting; Elements of geostatistics.

MST 804: Diving (1 Unit)
Basic materials and principles of swimming. Different swimming techniques. A sea-based practical course on diving, to enable students to acquire swimming and diving skills. Swimming, the first aspect of the training may be done in shallow lagoon/coast/beach waters but diving, which is the later and core aspect, will be carried out in the deeper waters.

MST 805: Applied Ocean Remote Sensing and GIS (2 Units)
Definition of Ocean Remote Sensing, Satellite ocean remote sensing, scientific significance of ocean remote sensing, Satellite ocean remote sensing system, and Main progress of ocean remote sensing; Fundamentals of Ocean Remote Sensing: Electromagnetic Radiation (EMR) and The Electromagnetic Spectrum, Satellite Orbits, Imaging and Scanning techniques, Resolution of satellite remote sensing; Visible/Infrared Remote Sensing: Satellite sensors and infrared radiometers, Theory of radiation, Atmosphere correction, Skin temperature, SST data processing and cloud removal, Future infrared radiometers; Microwave Remote Sensing: Microwave Radiometer, Scatterometer, Altimeter, Synthetic Aperture Radar (SAR); Future Oceanographic Satellite Systems.

MST 806: Advanced Marine Resources and Exploration (2 Units)
Instrumentation and modern techniques of investigating the physical, chemical and biological conditions at the bottom of the ocean for scientific and commercial purposes. Core drilling and recovered core sample analyses. Guides to mineralization and criteria for marine ore prospecting. Prospecting and exploratory stages of marine deposits and their characters. Human use of the resources in marine environment; Marine minerals. Energy resources of the ocean. Resources from the ocean floor. Mineralization in the oceans. Role of microorganisms in the economy and productivity of the sea. Use of coastal lands and waste disposal in the sea. Methods of sampling, drilling, logging and interpretation of drill hole data. Alluvial deposits. Definition and types of marine ore reserves. Marine Ore reserve estimation. Application of geophysical and geochemical methods in marine mineral exploration.

MST 807: Computational Methods in Oceanography (2 Units)

Elementary theory of errors. General interpolation and extrapolation techniques. Numerical solution of differential and integral equations. Numerical integration. Gaussian and Laguerre quadrature. Numerical differentiation. Finite Difference and Finite Element techniques. 'Least Squares' methods. Computer software languages and operation. General introduction to Basic MATLAB programming, netcdf, HDF file format processing and analysis. Limits, continuity and differentiability, mean value theorem, maxima and minima, error analysis and least square Techniques. Vector analysis, differentiation of a vector. Sequences and series, Fourier series, Tailors series. Elementary numerical analysis. Surface and volume integrals. The Fourier and Laplace Transforms. Solution of Laplace equations. Spherical Harmonic Analysis. Polynomial surface and their computation.

MST 808: Advanced Physical Oceanography (2 Units)

General oceanic circulation; Oceanic currents of the world; El-Nino current and climatology of coastal areas; Gyres and oceanic tides; Principal features of tidal phenomena; Tidal generating forces; Estimate of tidal current in the proximity of land; Analysis of storm surge phenomena; Air-sea interactions.

MST 809: Advanced Chemical Oceanography (2 Units)

Ocean-Atmosphere Chemical Interaction System. Effect of water on the earth's atmosphere. Transfer Processes. The Sea-Atmosphere Interface. Solar Radiation, Net Back Radiation, Conduction and Convection and latent heat release. Box Models; Geochemical mass balance: dissolved chemical inflow and outflow from the ocean, chemical residence times. Geochemical Cycles-Marine Nitrogen cycle; Marine Oxygen cycle; Marine Carbon cycle; Marine carbon chemistry and ocean acidification. Chemistry of the oceans. Chemical oceanography of the components of ocean waters. Chemical processes occurring in marine and estuarine waters and their impact on the near-shore and oceanic environments. Diversity of chemical nature and processes of marine sediments; Nutrient cycling. Oxygen and deoxygenation under climate change; changes in ocean ecosystems in Earth's history. Land-ocean coupling. (***It is a prerequisite to MST 10 (Marine Pollution and Pollution Control***)).

MST 810: Marine Pollution and Control (2 Units)

Historical perspective. Types of marine pollution. Sources of pollutants. Current episodes of marine pollution: oil pollution, plastic pollutions, ocean acidification, effects and remediation. Geochemical transformations and transport paths of pollutants in the ocean. Physical, biological, and chemical effects of effluent inflow and waste dumping. Quantitation of pollutants and their effects. Pollution attenuation: Technologies and policies. Policies, laws and regulations on the National and international level developed for the protection and/or conservation of the "good environmental status" of the marine environment. Measurement of chemical and biological pollutants. Marine pollution mitigation techniques. Establishment of international standard methods of sampling, sample preparation, and analysis for priority pollutants; methods of ultra-micro chemical analysis.

MST 811: Seafloor Petrology and Geochemistry (2 Units)

Geology and geochemistry of the oceanic crust. Structural and oceanographic setting of continents and ocean basins. Configuration and structures of the ocean floor with an emphasis on fractures and fault systems. Hydrothermal vents. Geochemical classifications of elements. Processes controlling elemental cycling between the earth's crust; Processes involved in the occurrence and transformation of organic substances in the marine environment. Role of marine microbes in geological and geochemical processes. Marine geochemical mapping principles. Role of organic matter in the carbon-, nitrogen-, phosphorus- and sulfur cycles in the marine environment; chemical composition of marine organic matter; biogeochemistry; diagenetic transformations of organic materials; organic matter decomposition and preservation; and petroleum geochemistry. Application of geochemistry to the search for organic products including gas hydrate, petroleum and natural gas. Ophiolite Complexes. Rare seafloor formations: mud volcanoes, subsea geysers, submarine slides, sea caves, seafloor craters and undersea explosions.

MST 812: Marine Isotopy (2 Units)

The principles of radioisotope dating techniques with an emphasis on those applicable to marine settings. Equations of radioisotope decay and in growth will be detailed along with the geochemical systematics of each technique. Theory of variations in the relative abundances of naturally occurring radioactive and stable isotopes. Applications will emphasize the use of isotopic tracers in studies of petrogenesis, geochronology, paleoceanography and paleoecology.

MST 813: Advanced Coastal Geomorphology and Hydrodynamics (2 Units)
Coastal zone-definition, concepts and issues. Dynamics of wind-driven coastal flow. The physical processes at the land-sea interface including estuaries, beaches and deltas. Water waves, tides, storm surge, sea level, sediment transport, beaches, circulation and mixing. Elements of coastal geomorphology, temporal–spatial dynamics of coastal landforms, coastal landform analysis, shoreline changes. Physical processes at the land-sea interface including estuaries, beaches and deltas. Estuarine and coastal water motion and transport. Morphodynamic processes operating on coasts and shelves. Non-deltaic coastal morphodynamic systems. Principles of waves, tides and currents with emphasis on shallow-water processes. (***It is a prerequisite to MST 16 (Coastal Geoha ards)).***

MST 814: Coastal Ecology and Biodiversity (2 Units)
The Principles of Ecology – Coastal Ecosystems (Basic principles that underlie the organization of marine communities and govern their behaviours, Factors controlling population growth and stability, quantifying interactions among populations that lead to persistent communities, Coupling of communities to form viable ecosystems, Flow of energy and cycling of materials, Processes of Photosynthesis and Re-mineralization of organic matter and nutrients, Primary production and productivity, Secondary production, Ecosystem zoning); Coastal Communities and Biodiversity in the Coastal Ecosystems; Marine Biodiversity and Distribution Patterns; Threats and Anthropogenic Activities affecting Coastal Marine Biodiversity in the West Africa; Modern Ecological Approaches: Biodiversity Conservation and Sustainable Development in the Blue Economy Framework; Techniques of Biological Samples Collection in the Marine Environment; Biodiversity Estimation Techniques; Ecological Assessment Techniques in the Coastal and Transitional Ecosystems with Biotic Indices.

MST 815: Ocean Waves and Dynamics (2 Units)
Linear water wave theory and its applications; Mechanisms of wave generation, the governing equations, wave properties, wave transformation; Special cases for tidal wave propagation, wave bottom boundary layer, nonlinear properties. Practical applications of numerical models for wind-wave generation, wave transformation, the spectrum analysis for wave measurements. Wind-driven gyre circulation, coastal upwelling, turbulence in stratified flows, large-scale waves, internal waves, and climate dynamics. Wind-wave climatology; Characteristics of wave parameters and wind; Extreme wave parameters and wind speed for different return periods; Spatio-temporal variability and linear trends of rough-sea occurrence; Evaluation of wave power density and wave energy density; Statistical analysis of sea surface conditions; Wind climate and energy.

MST 816: Coastal Geohazards (1 Unit)
Coastal Hazards; Causes of coastal hazards including geological, meteorological, oceanographic, and human-induced factors. Modes of occurrence of various coastal hazards, locations and their origins and mitigation measures; Hurricanes, cyclones and typhoons; Storm surges and flooding. Historical records of tsunamis; Tsunamis in a global context, implications for different continents; Natural versus man-made hazards; Cyclones, coastal erosion, tsunami, flood, storm surges, sea level rise and others; Tsunami early warning systems; Global warming induced sea level rise; Disaster risk management in an age of climate change. Marine pollution, Ground water rise, causes of rising ground water; Oil spills and coastal; Vulnerability assessment in coastal disaster management pertaining to cyclone, sea level rise and trends of coastal disaster management; Coastal early warning system.

MST 817: Advanced Marine Sedimentology and Stratigraphy (2 Units)
Origin of sediments. Surface processes- weathering, erosion, transportation, sedimentation and evolution of landforms. Ocean processes- turbidity currents and turbidites. Sedimentary rock and processes; Depositional environments; Sedimentary structures and analysis of paleo-current data; categories of sedimentary rocks; Establishment of biostratigraphy through interval, assemblage and abundance zones; Facies concept and facies analysis; Origin and evolution of sedimentary basins; Concept of sequence stratigraphy. Lithification and Diagenesis. Sedimentology and sedimentary petrology of rocks in marine environment. Concept and analysis of facies, biostratigraphic, lithostratigraphic and chronostratigraphic concepts. Stratigraphic mapping, Application of facies modelling to mineral exploration and environmental planning with case histories. Stratigraphy of Nigeria. ***It is a prerequisite to MST 30 (Petroleum Geology and Formation Evaluation)).***

MST 818: Applied Marine Ecology (2 Units)
Methods of ecological monitoring - State Variables - Methods of abundance estimation - Assessment of detectability - methods for visual surveys in the marine environment; Abundance Estimation with Distance Sampling methods - Applications in the marine

environment – Detectability estimation; Capture-recapture methods for closed and open populations - Applications in the marine environment; Removal methods (change-ratio, Eberhardt, Capture-Effort) - Applications in the marine environment; Presence-absence data - Estimation of probability of presence (occupancy); Methods for analyzing photographic samples of hard substrata.

MST 819: Advanced Marine Electrical Resistivity Methods (2 Units)

Marine electrical resistivity method – Basic principles, electrode configurations and geometric factors, modes of development, interpretation methods; Mise-a-la-masse method, applications and case histories of electrical exploration methods in coastal and marine environments; 2-D and 3-D marine and coastal resistivity tomography; Field exercises; Student to do Laboratory and field works that will involve mapping and modelling of the dynamics of coastal hydraulics. Instrumentation, field procedure, computation, interpretation and applications. Laboratory and field modelling of the dynamics of coastal hydraulics. Basic Equation of Geophysical Phenomena; Modeling conditions; Modeling parameters.

MST 820: Coastal and Marine Foundation Systems (2 Units)

Fundamentals of coastal structures design, design codes, guidelines and functional requirements. Structural, geotechnical, and materials considerations, for a variety of environmental conditions, including extreme wave and current environments, ice, and seismic loading. Meteorological, hydrological, geological and oceanographic data required for coastal structure design. Breakwaters, jetties and quay walls and dolphins-Hydrodynamic loading on such structures and structural design aspects. Functional designing of the various components of ports and marine terminals. Nearshore structures. Different types of ocean structures and systems (fixed, floating, semi-submersibles, submersibles, pipelines, etc.) for exploitation of oil and gas, minerals and energy of planning, design and construction. Structural analysis - Foundation and seabed anchors. Different materials for marine applications: metals, concrete and other materials for the marine environment - Principles of corrosion, properties and selection of materials, welding of materials and metals for marine use. Repair and rehabilitation of marine structures. Structural health monitoring of marine structures.

MST 821: Marine Geophysical Methods (2 Units)

Gravity methods – History of gravity exploration; Measurement of gravity. Gravity data reduction; Regional, residual anomaly separation. Interpretation of gravity anomalies; Reduction of magnetic data. Air-borne and sea-borne magnetic surveys. Electromagnetic methods – Introduction, principles and applications; electromagnetic waves polarization and depth of penetration; Airborne, sea-borne, and borehole EM surveying; Classification of electromagnetic methods. Electrical resistivity methods – Basic principles, electrode configurations and geometric factors, modes of development, interpretation methods; Electrical exploration methods in coastal and marine environments: fundamentals, instrumentation, field procedure, computation, interpretation and applications. mapping and modelling of the dynamics of coastal hydraulics. Seismic methods – Seismic theory. Loss of seismic energy, seismic energy sources, Refraction field methods and equipment refraction interpretation, applications and case histories. 3D seismic exploration, interpretation, vertical and horizontal resolution, identification of primary and secondary events, 3D structural and stratigraphy interpretation, applications. Vertical seismic profiling (VSP), Cross-hole seismology; synthetic seismograms, potential interpretation pitfalls; Shear waves in deep crustal study. (***A prerequisite to MST 22 (Marine Geophysical Data Interpretation)).***

MST 822: Marine Geophysical Data Interpretation (2 Units)

Interpretation of marine data acquired using different geophysical methods such as gravity, marine magnetic, marine controlled-source electromagnetic (in the shallow and deep-water environment), electrical exploration methods in coastal and marine environments, seismic methods.

MST 823: Advanced Marine Gravity and magnetic Methods (2 Units)

Gravity methods – History of gravity exploration; Newton's law of gravitation potential field equation, gravity units, variation of gravity with latitude, geological

factors affecting density, gravity reduction, density estimate from field result; Measurement of gravity: Absolute and relative gravity, conventional and marine gravity meters; marine field operations, marine gravity data processing, correction to marine gravity observations; Limiting anomaly characteristics, depth rules, geometric constructions and use of integral transformations; Computation of gravity and magnetic anomalies for irregular bodies; Regional, residual and vertical derivatives; Upward and downward continuation and their uses. Gravity data reduction; Regional, residual anomaly separation. Interpretation of gravity anomalies; Dead and total mass estimates. Application of gravity method in the ocean floor and deep-sea explorations. Geomagnetic Methods – Fundamentals of magnetic dipole interactions with applications to simple mass distributions**,** Gauss Theorem, units of geomagnetism, principles and elementary theory; magnetic properties of rocks, Earth's magnetic field. Instrumentation and marine magnetic data acquisition procedures. Reduction of magnetic data. Anomaly separation and interpretation. Air-borne and sea-borne magnetic surveys. Data acquisition and Interpretation. Application of magnetic methods and case histories in the ocean floor and deep-sea explorations. Magnetic response modelling.

MST 824: Marine Geophysical Data Processing (2 Units)

Processing of different marine geophysical data from gravity methods, marine magnetic, marine controlled-source electromagnetic (in the shallow and deep-water environment); electrical exploration methods in coastal and marine environments, seismic methods.

MST 825: Advanced Marine Seismology (2 Units)

Seismic methods – Introduction, seismic theory, wave equations and solution. Loss of seismic energy, seismic energy sources, Refraction field methods and equipment refraction interpretation, applications and case histories. 3D seismic exploration, interpretation, vertical and horizontal resolution, identification of primary and secondary events, 3D structural and stratigraphy interpretation, applications. Vertical seismic profiling (VSP), Check shot survey. Cross-hole seismology; synthetic seismograms, potential interpretation pitfalls; Applications. Shear waves in exploration, variation of amplitude with offset (AVO**).** Field techniques, processing and interpretation of modern seismic refraction sections, static correction charts. Propagation of seismic waves. Analytical treatment of elementary seismic reflection problems. Oil exploration in the deep sea: field techniques; processing and interpretation of seismic reflection sections, NMO charts.

MST 826: Marine Geodynamics (2 Units)

Plate tectonics: evolution of the crust, mantle and lithosphere, crustal growth processes, structure and mechanics of collisional orogens, mantle and lithospheric processes in relation to plate tectonic framework, mantle flow and circulation, heat flow in the crust; deep-seated crustal exhumation mechanisms. Concept of rock deformation: Stress and Strain in rocks, Strain ellipses of different types and their geological significance. Planar and linear structures, Concept of dip and strike. Folds: Fold morphology, Geometric and genetic classification of folds. Mechanics of folding; Foliation and lineation; Fractures and faults. Heat transfer: Fourier law, earth surface heat flow, 1D and 2D steady heat conduction, cooling of the lithosphere, thermal stress, ocean floor topography, thermal and subsidence histories of sedimentary basins, thermal structure of the subducted lithosphere. Rock rheology: elasticity, mantle and crustal rheology, mantle convection and cooling of the earth, viscoelasticity. Basic concepts of computational and chemical geodynamics, Modelling of geodynamic problems.

MST 828: Micropaleontology (2 Units)

Morphology, classification, biostratigraphy and geological history of major groups of microfossils, especially Foraminifera, Ostracoda and Conodonts. Paleoecology and current scheme of classification. Applied micropaleontology. Origin, migration and accumulation of hydrocarbon. Source rock characteristics and maturation scheme. Reservoir rocks and traps. Subsurface maps. Well logs, seismic data acquisition, processing and interpretation. Evaluation of petroleum potentials and reserves. Oil and gas wells: drilling, completion and production. Global oil reserves. Oil deposits in Nigeria. Oil and geopolitics. Pollen core (reconstructing past vegetation history); Reconstructing the Holocene evolution of the surface conditions; Quantitative reconstructions of past environmental conditions based on microfossils; Introduction of other microfossils.

MST 830: Petroleum Geology and Formation Evaluation (2 Units)
Origin and accumulation of petroleum. Distribution of oil and natural gas deposits as a function of geological conditions. Regional evaluation of petroleum potential search for high-quality crude oil, classification of crude oil, petroleum occurrences indicators. Mud Logging: measurements related to the drilling process, relevance to formation evaluation. Hydrocarbon type, pay counting, reserve estimation. Hydrocarbon movability, dielectric measurements, elastic formation properties. Porosity and water saturation determination from logs application or wireline logs in hydrocarbon exploration. Structured approach to log analysis, crossplots and overlays, porosity determination, drill stem testing, integrated formation evaluation. NMR logs – Principles and interpretation.

MST 831: Seminars on Oceanography (2 Units)
Literature study and oral presentation of a topic on an aspect of the area of specialization, as agreed by the candidate's supervisor.

MST 832: Advanced Marine Electromagnetics Methods (2 Units)
Introduction, principles and applications; electromagnetic waves polarization and depth of penetration; Airborne, sea-borne, and borehole EM surveying; Marine magnetotelluric (MT) method – principles of operation, Instrumentation, field measurements, interpretation methods and case histories; Marine controlled-source EM (mCSEM) – Instrumentation, modes of data acquisition, data processing, interpretation techniques, applications and case histories; Application of marine electromagnetic surveying for hydrocarbon exploration. Application of mCSEM in exploration for gas hydrate beneath the sea. Classification of electromagnetic methods. Amplitude and phase anomalies. Compensator method; Turam method. Moving source and receiver methods. Transient induced polarization method. Magnetotelluric methods. Application in resolving geological problems. Marine controlled-source Electromagnetic modelling (in the shallow and deep-water environment); Applications of modelling to geophysical interpretation.

MST 833: Sea Practical (3 Units)
A variety of oceanographic settings will be studied using physical, chemical, geological, geophysical and biological oceanographic techniques. A field-based course for 3 continuous weeks will be spent on a suitable Island to take measurements, collect and process samples and do analyses. This will be based along the West African coast, preferably anywhere that is directly sandwiched between the lagoon and the open sea. Students will have the opportunity to conduct oceanographic and meteorological measurements at sea and also to collect water, sediment and biological samples for laboratory study or analysis and do mapping of the coastal environment. Every student will submit a report at the end of the exercise. Physical, chemical, geological and biological field methods in oceanography. Field observation of sediment deposition at the coast. Identification of marine microfossils with the use of microscopes and relevant computer packages. Species diversity vs abundance of benthic and planktic organisms. Wave dynamics and tides – measurements and classification.

MST 834: Geophysical Fluid Dynamics (2 Units)
Dynamics of rotating stratified fluid flow in the atmosphere/ocean and laboratory analogues. Equations of state, compressibility, Boussinesq approximation. Navier-Stokes equation for viscous fluids, Cartesian tensors, stress-strain relations. Geostrophic balance, Rossby number. Poincare, Kelvin, Rossby waves, geostrophic adjustment. Ekman layers. Continuously stratified dynamics: Inertia-gravity waves, potential vorticity, quasigeostrophy. Theories, models of large-scale dynamics of oceans, atmospheres. Potential vorticity, Q principles; Rossby waves, ray tracing, Green's function, setup of general circulation; atmospheric "channels" versus ocean "basins"; wave-mean flow interaction, mountain drag, internal momentum flux; Eulerian equations for mass-motion; "Lagrangian" motion of particles, tracers; cascades, eddy flux of heat, moisture. introduction to singular perturbation techniques; linear instability theory.

MST 835: Graduate Internship (1 Unit)
Attachment to the factories that specialize in manufacture and fabrication of oceanographic equipment at local and corporate levels.

MST 839: Principles **of Physical Oceanography**.
(2 Units)
A review of the governing equations, dynamics of currents and waves on continental shelves and in estuaries. Fundamentals of wind and density-driven flow, and aspects of fronts, mixing, and secondary circulation. A time-dependent motion such as surface gravity waves, internal waves, and coastally trapped waves and tides

MST 836: Dynamics of the Ocean and Atmosphere (2 Units)

Basic equations of motion; Mass conservation equation and dynamic equation; Major ocean currents; Steady wind driven circulation; Theoretical models; Nonlinear effects in the boundary currents; Charney's inertial boundary layer; Models of the unsteady wind driven ocean circulation; Dynamics of the surface wave phenomena in the ocean; Wave interactions; Dynamics of internal wave phenomena; Micro-scale structure and oceanic turbulence

MST 838: Marine Hydrology and Forecasting (2 Units)

Hydrological Cycle; Precipitation estimate and measurement; Spatial and temporal variations; Ground water and aquifer characteristics; Surface water measurement of flow in natural channels, base flow and regression curves; Storms; Vegetation and water balance; Hydrological forecasting; Water resources systems; Identification and evaluation of water management plans, model and solution procedures; Probability concept; Time series and stochastic processes systems with dynamic uncertainty; River basin modeling; Stream flow and reservoir estimation; Flood control alternatives; Hydroelectric power production; River basin planning models; Irrigation planning and operation models; Water quality prediction and simulation; Reliability of receiving water quality simulation models; Lake quality management

MST 840: Descriptive Physical Oceanography (2 Units)

What oceanography means; Properties of sea water; Basic physical laws; Motion; Equations of motion (3 equations with 4 unknowns); Contribution of friction scaling, Dynamic instability; Geostrophic current, geopotentials, application of geostrophic equations; Barotropic and Baroclinic; Ekman solution, Ekman assumption and interpretation; Transport and upwelling; Current with friction and without friction; Westward intensification of ocean current, Thermocline circulation; Equations for salinity and temperature.

MST 841: Global Climate Cycles (2 Units)

Palaeoceanographic proxies (what type of measurements tell us about what particular climate aspect of the past, what are the main uncertainties?); Orbital forcing and cyclicity (how do solar variations over thousands of years influence our past, present and future climate system), including an introduction to time series analysis of geological data (how do we document the presence of regular climate cycles?); Modelling of past climate change (how do we gain a quantitative and mechanistic understanding of the past and what can this tell us about the future?); Research Themes (a broad overview of hot research topics in the field of Cenozoic palaeoclimate). Hands on experience of data manipulation, analysis, interpretation and modelling will be achieved through a series of practicals and computing exercises.

MST 842: Numerical Analysis of Wave and Wind Climate in Oceanic Basins (2 Units)

General introduction to Basic MATLAB programming; Introduction/Literature review on wind-wave climatology; Models, datasets and methodology; Characteristics of wave parameters and wind; Extreme (99th percentile) wave parameters and wind speed; Extreme (99th percentile) wave parameters and wind speed for different return periods; Spatio-temporal variability and linear trends of rough-sea occurrence; Evaluation of wave power density and wave energy density; Statistical analysis of sea surface conditions; Wind climate and energy

MST 843: Ocean Circulation Observations (2 Units)

Ocean thermodynamics; dynamics of rotating; homogeneous fluids; ocean circulation; western boundary currents; the thermocline, oceanic fronts. Global energy balance. General circulation in the oceans and atmosphere. Thermodynamics and stability. Fundamental fluid mechanics. Surface gravity waves. Geophysical fluid mechanics. Tides and other long waves. Theories of global circulation.

MST 899: MTech Research Project (12 Units)

Students will research their areas of interest and will be supervised by relevant members of staff. The subject of study must be related to any aspect of applications in the Department.

PROPOSED CURRICULUM FOR DOCTOR OF PHILOSOPHY (Ph.D)

1. PROGRAMME OFFERED AND AVAILABLE OPTIONS

Doctor of Philosophy (Ph.D) in Marine Science and Technology.
Available Options:

(f) Chemical Oceanography
(g) Marine and Coastal Environmental Science
(h) Geological Oceanography
(i) Marine Geophysics
(j) Physical Oceanography

2. PROGRAMME PHILOSOPHY

The Ph.D in Marine Science and Technology is a research-based programmethat culminates in a unique thesis that demonstrates original and creative research. It is designed to provide advanced theoretical and practical training in the application of Marine Science to assess the mineral resources of the seafloor, make scientific predictionsof certain hazards and add to the scientific understanding of the Earth using marine research methodologies. With a highly individualized structure of the study, the programme provides candidateswith in-depth knowledge in their chosen research area within Marine Science and Technology. Upon completion of the programme, candidates can set their research direction and work at the forefront of cutting-edge research in academia or the industry.

3. PROGRAMME OBJECTIVES

The main goal of the Marine Science and Technology doctoralprogramme is to assist in high-level manpower development for the public and private sectors, and in capacity building for institutions of higher learning and research centres.
The specific objectives are to:

(iv) expose the candidates to current research and up-to-date methodologies in the field of Marine Science and Technology and enhance their conceptual understanding of the applications of research methodologies to solving marine-related problems;
(v) produce manpower that isresearch-oriented in Marine Science and Technology for the sustenance of teaching and research in institutions of higher learning and other related establishments;
(vi) provide expertise relevant to the public and private sectors and non-governmental organizations; and
(vii) provide professional skill-acquisition training towards self-employment and job creation.

4. PROGRAMME JUSTIFICATION

The Department of Marine Science and Technologyplans to fill gaps that exist in training of high-level manpower in the discipline of oceanography at this Ph.D level within the country. Prospective candidates for the programme yearning for manpower development abound in several higher instituions of learning and many government agencies at State and Federal levels. It will also enhance manpower development for the public and private sectors of the Nigerian economy.

5. ADMISSION REQUIREMENTS

Candidates seeking admission to the Doctor of Philosophy (Ph.D) degree programme in Marine Science and Technologyshould possess any of the following qualifications:

(i) M.Tech (Marine Science and Technology) of The Federal University of Technology, Akure (FUTA),with at least 3.5 on the 5-point CGPA scale.
(ii) Master's degree or its equivalent from any other approved Universities, with at least 3.5 on the 5-point CGPA scale and/or 60% minimum average score. The candidate may be required to take some Master's degree courses to make up for any deficiencies, as may be deemed necessary by the Departmental Postgraduate Committee.

6. PROGRAMME DURATION

The programmewill be for a minimum of thirty-six (36) months and maximum of forty-eight (48) months on a full-time basis, while it will be for a minimum of forty-eight (48) months and maximum of sixty (60) months on a part-time basis.

7. GRADUATION REQUIREMENTS

The assessment of candidates for the award of the Ph.D degree shall be based on *vivavoce* (oral) examination of a thesis emanating from in-depth original research. To be eligible for the award of the Doctor of Philosophy

degree in Marine Science and Technology, a candidate must have:

(i) present at least three seminars (a proposal, progress and final);
(ii) fulfilled all other conditions as prescribed by the Board of School Postgraduate Studies of the University; and
(iii) successfully completed and defended a research thesis in an oral exanimation.

8. COURSE OUTLINE

Compulsory Course for All Options

Course Code	Title	L	T	P	U
MST 999	Ph.D Research Project	0	0	36	12
	Total				**12**

9. COURSE SYNOPSIS

MST 999:Ph.DThesis Research Project
(12 Units)

An original research project which must involve independent investigations into any research focus in Marine Science and Technology, under the supervision of qualified staff. The product of the research must contain definitive contributions to knowledge. Every candidate must present at least three seminars in the Department and in the School before the submission of the Ph.D thesis that will be subjected to an oral examination

10. LIST OF ACADEMIC STAFF

A. NON-ACADEMIC STAFF

S/N	Name of Staff	Qualifications	Status	Area of Specialization
1	Dr. A. F. Folorunso	BSc., MSc. (Ago-Iwoye); D.Sc. (Qingdao)	Senior Lecturer/ Ag. HOD	Marine Geophysics; Sea Resources Exploration
2	Prof. Y. A. Asiwaju-Bello	BSc., MSc. (Ife), Ph.D. (Leeds)	Professor	Coastal Hydraulics/ Marine Geology.
3	Prof. M. I. Oladapo	BTech., M.Tech., Ph.D. (Akure)	Professor	Marine Geophysics/ Coastal Geotechnics
4	Prof. E. C. Okogbue	BSc., MSc., Ph.D. (Ife)	Professor	Marine Meteorology
5	Prof. A. A. Balogun	BTech., MTech., Ph.D. (Akure)	Professor	Marine Meteorology
6	Dr. A. Oluleye	BTech (Akure); M. Sc. (Dundee), Ph.D. (Akure)	Reader	Marine Meteorology
7	Dr. V. Ajayi	BTech., MTech., PhD (Akure)	Reader	Marine Meteorology
8	Dr. A. Akinbobola	BTech., MTech., Ph.D. (Akure)	Reader	Physical Oceanography
9	Dr. N. E. Olowokere	LLB., LLM., Ph.D. (Ilorin)	Reader	Maritime Laws
10	Dr. A. A. Adelodun	B.Sc. (Ilorin), M.Sc. (Ibadan), Ph.D. (Seoul)	Senior Lecturer	Marine and Environmental Chemistry
11	Dr. O. A. Dada	B.Tech. (Akure), MSc (Jos), D.Sc.(Qingdao)	Senior Lecturer	Geological Oceanography; Coastal Processes & Dynamics
12	Dr. A. A. Osinowo	BTech., M.Tech (Akure), D.Sc.(Qingdao)	Lecturer I	Physical Oceanography
13	Dr. (Mrs) O.A. Bamisaiye	BTech., MTech., (Akure), Ph.D. (South Africa)	Senior Lecturer	Marine Geology
14	Dr. O. A. Nubi	B.Sc. (Abeokuta), M.Sc. (Ibadan), M.Phil. (Ibadan), Ph.D. (Abomey-Calavi)	Lecturer I	Adjunct Lecturer Chemical Oceanography
15	Dr. O.J. Akinrinade	B.Tech. (Akure), M.Sc (Leeds); D.Sc. (Zhejiang)	Lecturer I	Marine Geophysics, Exploration Geophysics, Tectonophysics, Geodynamics
16	Dr. K. Chukwuma	B.Sc. (Awka), M.Sc. (Benin), Ph.D. (Cape Town)	Lecturer II	Biogeochemical Oceanography
17	Dr. (Mrs) M.O. Ogundare	B.Sc. (Zaria), M.Tech. (Akure), Ph.D. (Stellenbosch)	Lecturer I	Chemical Oceanography
18	Dr. T.I. Asowata	B.Sc. (Awka), M.Sc., Ph.D. (Ibadan)	Lecturer I	Marine Geology
19	Dr. (Mrs) O. R. Ashiru	B.Sc. (Zaria), M.Sc. (Ibadan), Ph.D. (Beijing)	Lecturer II	Geological Oceanography/ Sedimentology

9.4.4 DEPARTMENT OF METEOROLOGY AND CLIMATE SCIENCE (MCS)

1.PROGRAMMES OFFERED

(a) Postgraduate Diploma (PGD)
(b) Masters of Technology (M.Tech)
(c) Doctor of Philosophy (Ph.D)

2. AVAILABLE OPTIONS / SPECIALIZATION

(a) Postgraduate Diploma (PGD)
Meteorology and Climate Science
(b) M.Tech with specialization in
(i)Climate Dynamics
(ii) Environmental Meteorology
(iii) Agricultural Meteorology & Water Resources System
(iv) Aviation and synoptic Meteorology

(c) Ph.D with specialization in

(i) Climate Dynamics
(ii) Environmental Meteorology
(iii) Agricultural Meteorology & Water Resources Systems
(iv) Aviation and synoptic Meteorology

3. PHILOSOPHY AND OBJECTIVES

(a) Postgraduate Diploma (PGD)

The major objectives of the programme are:

(I) To enhance the employment opportunities of graduates from other fields, in an economy increasingly faced with the challenges of solving problems posed by the impact of industrial activities and weather on the environment.

(ii) To prepare graduates from other fields who may wish to pursue graduate studies in Meteorology up to the Masters and PhD level

(iii) To enhance self-employability of graduates from the basic sciences by empowering them with skills needed for applied services in agriculture, water resource management, climate change impacts, atmospheric pollution, and alternative energy (wind, solar, etc.) exploitation, building climatology, coastal engineering and transport meteorology.

(iv) To provide further technological expertise to workers in Federal, State and Local Government agencies such as the Environmental Protection Agency (EPA), Waste Management Boards, Agricultural Development Projects (ADP**)** and Agencies and Oil and gas producing companies.

(b) M.Tech/Ph.D Programmes

The philosophy of the programme is to train students to become practicing meteorologists and scientists for the research and services sectors of the economy. The objective of the programme is to produce professional personnel equipped with the research and technological skills required to face current and future challenges and be able to provide solutions to atmospheric, agricultural, environmental and other socio-economic problems occasioned by the interplay of weather, climate and anthropogenic factors.

5. ADMISSION REQUIREMENTS

a). Postgraduate Diploma

(I) B.Sc./B.Tech. with at least a third class in any of the following: Geography, Urban and Regional Planning, Agricultural, Biological and Chemical Sciences,

(ii) B.Sc/B.Tech. with at least a Third Class or HND with Lower Credit in Meteorology or any of the Physical Sciences, and

(iii) Other equivalent qualifications recognized by Senate.

b). M. Tech

In addition to the University's general admission regulations and guidelines, first degree graduates of FUTA or any other recognized university with a minimum of second class division (Lower Div.) in the following disciplines are considered:

i) Meteorology,
ii) Physical Sciences and Engineering,
iii)Mathematics. and
iv)Computer Science

Candidates with a minimum of upper credit at the PGD level in meteorology are also eligible.

c). Ph. D

Candidates with Masters degree in Meteorology, Physics, Mathematics or Computer Sciences, normally with Ph.D grade may be admitted into the Ph. D programme. In addition, holders of Masters Degree from other institutions may be required to audit and pass some courses that may be prescribed by the department.

6. DURATION OF PROGRAMME: a).

Postgraduate Diploma

The programme, which will normally be on part-time (week-ends only), will cover a period of three semesters.

b). M. Tech

Full Time: 18 months. Senate may approve an extension where necessary

c). Ph.D

Full Time: 36 months; Part Time: 48 months. Senate may approve an extension where necessary

7. REQUIREMENTS FOR GRADUATION

a) Post-Graduate Diploma

Each diploma student will be required to complete and pass successfully a minimum of 43 credit units, which must include 6 units of supervised project.

b) M. Tech

Each student will be required to complete and pass a minimum of 57 credit units which must include 12 units of supervised project.

(c) Ph.D

All candidates are expected to carry out original research project supervised by approved post-graduate Lecturers and successfully defend same in accordance with the postgraduate school regulations.

8. OUTLINE FOR EACH PROGRAMME

A). POST-GRADUATE DIPLOMA

1ST SEMESTER

Course Code	Course Title	L	T	P	U
MET701	Introduction to Atmospheric Science and Radiation	3	0	0	3
MET703	Introduction to Boundary Layer Meteorology	3	0	0	3
MET705	Instrumentation and Environmental Measurements	0	0	6	2
MET707	Tropical Weather Systems	2	0	0	2
MET709	Meteorological Observations and Practice	0	0	6	2
MET711	Mathematical & Statistical Methods in Meteorology	2	0	3	3
	Total				**15**

2ND SEMESTER

Course Code	Course Title	L	T	P	U
MET 702	Atmospheric Dynamics	3	0	0	3
MET 704	Urban And Air Pollution Meteorology	2	0	0	2
MET 706	Introduction to Remote Sensing And Satellite Meteorology	3	0	0	3
MET 708	Air-Sea Interaction And Climate Change	2	0	0	2
MET 710	Marine Meteorology & Oceanography	2	0	0	2
	Total				**12**

3RD SEMESTER

Course Code	Course Title	L	T	P	U
MET 799	PGD Research Project	0	0	0	6

b). M. TECH

1ST Semester: Compulsory Courses

Course Code	Course Title	L	T	P	U
MET 801	Pure and Applied Meteorology	3	0	0	3
MET 803	Meteorological Analysis	0	0	6	3
MET 807	Advanced Tropical Meteorology	3	0	0	3
MET 811	Statistical & Numerical Methods in Meteorology	2	0	3	3
MET 817	Air/Sea Interactions	2	0	0	2
MET 805	Dynamics of the atmosphere and Climate change	2	0	3	3
	Electives	6	0	0	6
					20

***Electives:(Students will be guided in selecting elective courses, depending on the* degree option chosen.)**

Course Code	Course Title	L	T	P	U
MET 809	Upper Air Meteorology	3	0	0	3
MET 813	Water Resources System	3	0	0	3
MET 815	Urban Meteorology and Climatology	3	0	0	3
EEE 821	Instrumentation in Engineering	3	0	0	3
CSP 803	Agro- Climatology and Plant physiology	3	0	0	3
URP807	Environmental Engineering	3	0	0	3
URP 827	Environmental Impact Assessment	3	0	0	3

2ND Semester: Compulsory Courses

Course Code	Course Title	L	T	P	U
MET 802	Lower Atmospheric Processes	2	0	3	3
MET 804	Physical and Dynamical oceanography	3	0	0	3
MET 808	Advanced Radar and Satellite Meteorology	2	0	3	3
MET 812	Advanced Instrumentation and Environmental Measurements	1	0	6	3
MET 818	Remote Sensing & GIS Applications in Meteorology	2	0	3	3
MET800	Seminar	0	0	6	2
MET 820	Field work	0	0	6	2
	Electives				6
	Total				**23**

Electives: (Students will be guided in selecting elective courses, depending on the degree option chosen.)

Course Code	Course Title	L	T	P	U
MET 806	Atmospheric Models	2	0	3	3
MET 810	Advanced Agricultural Meteorology	2	0	3	3
MET 814	Environmental Pollution and Control	2	0	3	3
MET 816	Meso-scale Meteorology	3	0	0	3
PHY 806	Measurement Laboratory & Experiment Techniques	1	0	6	3
	TOTAL				**15**

C. Ph. D

Course Code	Course Title	L	T	P	U
MET 999	Ph.D thesis research project				12
	Total				12

9. COURSE SYNOPSIS

A). POST-GRADUATE DIPLOMA

MET 701: Introduction to Atmospheric Science and Radiation (3 Units)

Detailed treatment of atmospheric variables (pressure, temperature, etc); their variations in time and space. Moisture variables – mixing ratio, specific humidity etc. Pressure systems. Lapse rates – environment, dry and wet adiabatic lapse rates; the effect of latent heat release. Types and characteristics of atmospheric stability. Relationship between lapse rates, stability and clouds. Types of clouds and their classification. Types of precipitation associated with clouds. Scales of motion in atmosphere. Pressure gradient and Coriolis forces. Atmospheric motion: geostrophic, gradient and thermal wind. Divergence and vorticity. Air masses and source regions. Air masses affecting tropical and temperate regions. ITD and ITCZ. The polar front and fronted slopes. Life cycles of frontal depressions. Frontal cross-sections.

The solar system: Gravitation; the planets; the moons, comets and meteors. The sun: solar atmosphere; activity regions: sunspots, solar flares, solar wind, solar radiation and the Earth's atmosphere. Absorption , scattering and transmission of radiation. Attenuation of radiation under cloudy and cloudless condition.

MET 702 : Atmospheric Dynamics (3 Units)

The physical laws governing atmospheric motion. Law of thermodynamics. Phase changes. Clausius-Claperyon equations. Thermodynamics of moist and dry processes. Derivation of expressions for the adiabatic lapse rates. Parcel tracers; potential temperature, equivalent and wet-bulb potential temperature etc. types of atmospheres. Atmospheric statics: stability criterion for both dry and moist ascent. Thermodynamic diagrams and their uses. Practical exercises with the T-gram; determination of updraft velocities and precipitation rates. Forces acting on a fluid element. Equations of motion of a non-inertia (rotating) frame of reference. Effect of the shape of the earth on the equations. Scale analysis of the full equations leading to the hydrostatic, geostrophic approximations. The continuity equation. The thermal wind equations-Barotropic and Baroclinic atmospheres. Thermal wind and jet streams. Thermal wind and advection. Circulation and vorticity. Application to land and sea breezes. Divergence and convergence. Derivations and discussion of the vorticity equation; middle latitude and tropical cases.

MET 703: Introduction To Boundary Layer Meteorology (3 Units)

Simplifications used in describing the boundary layer. Constant and variable eddy viscosity. Wind profile near the surface; Ekman spiral. Log and power laws for neutral stability Roughness length. Stability parameters: Richardson's number (Ri), and its fluxes form; Monin-Obukhov parameter, Z/L, and its relation to Ri. Dispersion of pollutants in boundary layer (e.g. smoke, dust). Specification of turbulent fields: velocity correlation and cross-correlations (with temperature and moisture). Turbulent energy equation. Eddy transfer coefficients. Turbulent transports of heat, moisture and momentum. Flux profiles. Bowen ratio and Penman's formula for heat and evaporation estimates. Importance of eddy transports especially for agriculture and to tropical weather systems.

MET 704: Urban And Air Pollution Meteorology (2 Units)

Atmospheric pollution and types; green house gases, ozone depletion and health hazard; effect on ecosystems. The hypsometric equation, lapse rates. Atmospheric stability, potential temperature, potential density. Introduction to microscale and mesoscale meteorology, Brunt-Vaisalla frequency. Graphical representation of atmospheric data. Types of Pollutants (Active and Passive). Atmospheric chemical reactions. Dispersion and plume rise, source strength, characteristic plume shapes, removal mechanisms, terrain effects, dispersion models. Estimation of local diffusion and air pollution from meteorological data. Meteorological factors affecting diffusion, dispersion, industrial stacks. Effects of atmospheric stability on pollutant dispersion and transport. Local Climate (Land and sea Breeze). Building Climatology. The heat island. Wind structures in urban areas. Humidity fields. Urban flood control and Management. Models of urban temperature and wind fields. Human biometeorology. Climate and urban planning. Weather forecasting for urban areas. Weather modification.

MET 705 :Instrumentation And Environmental Measurement (2 Units)

Fundamental principle of meteorological instrumentation. Basic requirements; sensitivity, errors, durability, ease of use, maintenance. Exposure problems. Spot and continuous measurements: General instrumentation to monitor precipitation, winds, evaporation, solar radiation, temperature, pressure, clouds, visibility and sea salinity. Upper air: radiosonde and radio-theodolite techniques. Use of radar and satellites: Infrared measurement and imagery. Instrumentation in micrometeorology: Soil temperature, moisture and heat flux. Leaf area index, leaf/canopy resistance, solar radiation, eddies. Pollen disposal. Hydrological measurement water current, water table. Observation system: Automatic stations, marine, aircraft and satellite observations Instrumentation in Air Pollution measurement

MET 706: Introduction to Remote Sensing and Satellite Meteorology (3 Units)

Electromagnetic radiation principles. Remote sensing of the earth surface utilizing the electromagnetic spectrum. History of aerial photography and aerial photography. Vantage point. Cameras, Filters and films. Element of visual interpretation. Photogrammetry. Microwave imagery from Airplane. Satellite and manned spacecraft platform. Remote sensing systems: multi-spectral, thermal infra red, active and passive microwave, optical sensors, RADAR and LIDAR. Remote sensing applications for meteorological parameters, vegetation (NDVI, ENVI, etc), water systems, urban landscape, soils, minerals and Geomorphology, SST and wind (e.g. QuickSCAT). Satellite orbits, types of satellites, visible and infrared imagery. Surface temperature measurements; upper air temperature and moisture soundings; determination of upper winds. Problems of interpretation of data and assignment of levels to wind measurements; effects of local influences (e.g. mountains). Uses of satellite information in weather forecasting, soil moisture monitoring, dust haze occurrence and movement, drought occurrence.

MET 707: Tropical Weather Systems (2 units)

The mean state of the tropical atmosphere (temp, pressure, RH and winds structure). Winter and summer situations. Major motion systems: ITD, ITCZ (in detail), monsoons, TEJ and AEJ: their climatology, causes and importance for tropical weather systems, Instability of tropical flows; structure and dynamics of easterly waves and vortices.

Upper level flows. The westerly jet in winter. Hurricanes and Typhoons, their large- and meso- environments; Quasi-Berenial Oscillatio (QBO), its causes and uses. Precipitation distribution in time and space; influence of AEJ and TEJ. Climate change and precipitation. Forecasting methods: empirical,statistica/empirical, dynamic/empirical, numerical and difficulties in the tropics.Usefulness of Global efforts and experiments for the tropics, e.g. CLIVAR-Africa,AMMA etc.

MET 708: Air – Sea Interaction and Climate Change (2 Units)

Basic observations of the coupled ocean-atmosphere system: Mean conditions at the air-sea interface, seasonal cycles, intraseasonal and interannual variability. Understanding the atmospheric response to sea surface temperature anomalies; clouds; convective boundary layer. Interactions between the tropical Ocean and Atmosphere. Climate science; solar and terrestrial radiation. Energy balance. heat fluxes (sensible, latent and ground heat fluxes). Anthropogenic changes; Climate forcing agents. Ozone depletion: causes and effects. Climate change detection and attribution. ENSO. Global warming and climate variability and change. West African monsoon and precipitation: impact of desertification and deforestation; albedo effects. Future climate; Future emissions and climate change. Future climate predictions.

MET 709 Meteorological Observations and Practice (2 units)

Basic meteorological variables and methods of observation. Briefs descriptions of the instruments for measurement of both surface and upper air information. WMO Codes for surface and upper air data (Synoptic and Temperature Codes including AIREP messages). Actual observations and coding practice. Plotting Practice: surface and upper air Charts. Introduction to divergence and vorticity. Types of analysis (isobaric, streamline, isallobaric etc.) and their uses and limitations. Applications to middle latitudes and tropics. Actual scalar analysis of meteorological parameters (temperature, wind components etc.) Isobaric and streamline analysis – sequences of simple surface and upper air charts for middle and low latitudes illustrating different synoptic situations. Preparation of briefs for air-pilots, mariners and other users. Links with the Central Forecast Office and International Offices. Organization and management of weather stations, offices and research posts

MET 710: Marine Meteorology and Oceanography (2 units)

The major ocean currents; characteristics, similarities and connection with atmospheric general circulation. Under-water topography and effects on upwelling and sea surface temperatures and hence climate, with special reference to the Gulf Stream, El Nino and the Gulf of Guinea currents etc. sea fogs. Definition of water masses by temperature and salinity. Oceanic gyres, eddies and fronts; comparison with synoptic meteorology; cross-sections across oceanic fronts. Stratification in the Oceans: the creation, growth and decay of transient and seasonal thermoclines; Tracer (dye) studies of thermoclines, internal waves on thermoclines. Upwelling and thermocline effects on fisheries.

MET 711: Mathematical and Statistical Methods in Meteorology (3 Units)

Functions of Real Variables. Differential and Integration Calculus and their applications. Error analysis, Interpolation and approximations. Vector analysis : Dot and Vector product, Curl Divergence of Vector fields. Matrices and its application in solving Meteorological problems. Decomposition of Meteorological parameters into Mean and turbulent parts. Introduction to tensor analysis. Location and Dispersion measurement in a sample and grouped data (Mean, Mode, Median, Standard Deviation etc); Regression (Linear and Multiple) and Correlation, their use in prediction of Meteorological variables. Analysis of Variables (ANOVA) and Covariance. Test of hypothesis. Normal and Binomial Distribution.

MET 713: Seminar (2 units)

A term paper on a chosen topic on application of meteorology to solve an industrial or societal problem will be presented by each student.

MET 715: Agricultural Meteorology (3 Units)

Weather observations for Agriculture, the Meteorological variables: winds, precipitation, evaporation, evapotranspiration (potential and actual) temperature, winds and humidity extremes. Suggestion of suitable regions for crop production. Local variations and crop/animal production. Investigation of atmospheric conditions within a crop. Electrical analogues. Farming systems: Cultural practices including land preparation timing and technique as functions of the climate. Causes and effects of soil erosion. Crop-weather modelling for yields and growths. Climate and seasonal forecasting for agriculture: onset, cessation, length of rainy season and length of growing season, selection of crop/seed type; Effect of climate variability & change on agricultural practice and production; irrigation, mulching, frost protection, wind breaks, etc.

MET 717: Hydrometeorology (2 Units)

The hydrological cycle and major precipitation processes. Conversion of rainfall measured at a point to area estimate; topographic influence. Evaporation processes; Measurement and estimation of evaporation by Penman's method. Water balance; periods of surplus an deficit. Soil moisture infiltration, soil moisture storage and measurement of flow in natural channels and with structures. Factors affecting runoffs, storm run-off and the unit hydrograph. Effect of vegetation on water balance. River basin development in relation to river regimes. Droughts and its effect on ground water movement and table. Hyrometeorological practice; present techniques and trends in the tropics.

MET 799: PGD Research Project (6 Units)

Each student will be required to undertake an in-depth but supervised project in any area of interest applicable to meteorology.

B). M. TECH PROGRAMME

MET 801 :Pure And Applied Meteorology (3 units)

The atmosphere and profile of meteorological parameters. Pressure and temperature systems. Air masses. Fronts and Disturbance lines. Clouds and associated precipitation. the mean global circulations. Scales of atmospheric motion. Pressure gradient, and Coriolis forces. Geostrophic and thermal winds. Momentum and conservation equations. Global energy budget and fluxes; order of magnitudes. Thermodynamics laws, phase changes. Clausius-Claperyon equations. Lapse rates and stability in both dry and moist atmospheres. Potential equivalent and wet-bulb temperatures. Energy diagrams. General applications of meteorology in Transportation, Agriculture, Urban and Town Planning, Building Technology, Construction and Food Industries. Water Resources Systems, Environmental Pollution. Major weather hazards; turbulence, icing, fog, haze, storms, hurricanes and tornadoes. Regular PG paper presentation.

MET 802: Lower Atmospheric Processes (3 Units)

Description and evaluation of the boundary layer. Temperature, humidity and wind profiles and related fluxes of heat moisture, and momentum. Temporal and spatial variation of fluxes. Surface stress and measurements/estimates. Laminar and turbulent flow. Characteristics and description of turbulence, Micro-meteorological methods of determining surface mass, momentum, moisture and energy fluxes. Applications in pollution modeling and numerical weather prediction.

MET 803: Meteorological Analysis (3 units)

Basic variables of synoptic analysis. WMO codes. Observation, coding and plotting techniques. Chart Analysis. Deduction of likely developments using isallobaric, isobaric, Sutcliffe and Streamline techniques. Special problems in the tropics. Use of energy diagrams, satellite and radar information and teleprinters in forecasting. Importance of local experience such as topography and distance from oceans. Preparation of briefs for air-pilots, mariners and other users. Links with the Central Forecast Office and International Offices. Organisation and management of weather stations, offices and research posts.

MET 804: Physical and Dynamical Oceanography (3 Units)

Major ocean current. steady wind-driven circulation. Theoretical models . Non Linear effects in the boundary currents. Charneys inertia boundary layer. Models of unsteady wind driven ocean circulation. Dynamics of surface waves in the ocean, wave interactions. Dynamics of inertia wave phenomena. Micro- scale structure and oceanic turbulence. General oceanic circulation. The El-Nino current, Climatology of coastal areas. Gyres and oceanic tides. Principal features of tidal phenomenon. Tides generating forces. Estimates of tidal current in the proximity of land. Analysis of storm surge phenomena.Air –sea interactions.

MET 805: Dynamics of the Atmosphere and Climate Change (3 Units)

Basic equations of motion. Mass conservation and thermodynamics. Primitive equations in z-coordinates, pressure coordinates and sigma coordinates. Useful approximations: Geostrophic balance, thermal wind, barotropic and Baroclinic flows. Circulation and Vorticity: Bjerkins theorem, Conservation of potential vorticity and the applications, Relative vorticity equation. Barotropic Vorticity Equation, Free Rossby waves. Quasi-geostrophy theory: Stationary Rossby waves, Baroclinic instability: Two-level (Philips) model. Dynamics of Tropical Atmosphere, Tropical Stationary waves, Kelvin waves. Understanding the atmospheric response to sea surface temperature anomalies; clouds; convection; boundary layer. Introduction to the Big bang theory. Paleoclimatology; Recent centuries and the last 100 Million years. Climate science; solar and terrestrial radiation. Energy balance. heat fluxes (sensible, latent and ground heat fluxes). the carbon cycle. Physical climate interactions. Chemistry, biogeochemistry and biosphere-climate interactions. natural modes and coupled systems. Anthropogenic changes; Climate forcing agents. aerosol forcing of climate. climate models and simulation of current climate. Climate change detection and attribution. Future climate; Future emissions. Future climate predictions. Effects of climate change. Study of Climate sensistivity using Simplified Climate models. Statistical Methods in Climate Reseach: Significance and Hypothesis; Vector Autoregresive Models; Power Spectrum, Climate Predictability

MET 806: Atmospheric Models (3Units)

General equation of atmospheric motions with scale analysis. Barotropic and baroclinic atmospheres. Concepts of atmospheric instability. Selection principle. Parameterisation of energy fluxes (radiation, moisture, momentum) in atmospheric models. Perturbation theory. Energetics of real atmosphere (available potential energy). Multi-level models. energy conversion and the general circulation.

Met 807: Advanced Tropical Meteorology (3 Units)

Structure and climatology of tropical systems, ITD, AEJ and meso-scale systems such as shearlines, thunderstorms, cloud clusters, typhoons and monsoons. Squall lines. Dynamics and energetics of the tropical systems. Structure and dynamics of easterly waves. Rainfall models. Land and sea breezes. Dust haze and fog. Upper level flows. Climate change/variability and Early Warning Systems.

MET 808: Advanced Radar And Satellite Meteorology (3 units)

Principles of radar, the radar equation. Radar equation of spherical particles - limits and resolution. Attenuation. Use of radar for precipitation measurements - rainfall amount and intensity over an area. Pulsed doppler radar; doppler spectrum and shift frequency. Measurement of turbulence, updraft velocities, size distribution and wind speed. Use of radar in cloud physics research, weather forcasting and mesoscale convective systems (MCS); Extent of convective clouds, growth and duration of convective clouds, growth and duration of convective clouds. Bright band. Cloud seeding tests. Radar observations of medium and large scale systems. Clear air echoes. Physical principles of earth satellite and their sensors, radiometers, limits of resolution, interpretation of Infra-red and visible images, inversion of CO_2 emission data. Interpretation of data. Effects of local influences. Uses of satellite information in weather forecasting, soil moisture monitoring, dust haze occurrence and movement, drought occurrence.

Met 809: Upper Air Meteorology (3 Units)

Atmospheric nomenclature. Basic and hydrostatic equations. Scale height. Energy budget and radiative transfer. Atmospheric chemistry and physics (photo dissociation; collision frequency). Tidal and wind oscillations. Gravity waves. Interaction with the lower atmosphere. Atmospheric electricity. Solar wind. Radiowave propagation. Quasi-biennial Oscillation (QBO). Pressure changes in the upper atmosphere. Jet streams, Polar front jet (PFJ), association of jet streams with active frontal systems in the mid-latitude, the significant of the position of the jet stream, relation of upper air features to surface weather patterns, climate change , food and crop production.

MET 810: Advanced Agricultural Meteorology (3 Units)

Agroclimatology, Agroecology zoning, Agrometeorology observation, Biotic (phenological) and abiotic (physical environmental) observations. General introduction to meteorology, Weather elements and observations, Instrumentation, associated errors and problems. Agricultural practices, Plant water relations photosynthesis. Respiration, Growth and development, Crop protection and distribution, Animal environmental requirements. Feed, nutrition and environmental management. Farming system and crop production, Evaporation and crop water use, crop weather and yield models, modification of microclimate, pest and disease management climate and strategic decision making in agriculture Assessment of climate change and its impact on agriculture, Forest fire and weather, drought and desertification. Growth equations Agrometeorological statistics and forecasting techniques. Field and laboratory experiments in agrometeorology. Phenological climatology. Daylight spectrum and crop performance. Soil and land-cover climates. Leaf and canopy resistance to flux parameters. Canopy architecture. Crop-atmosphere interactions. Gaseous toxicity and plant growth. Biomass and productivity. Disease and pathogen vectors, climate of orchards and forests.

MET 811: Statistical and Numerical Methods in Meteorology (3units)

Significance and Hypothesis Testing. Covariance matrices, quadratic forms, associated sampling distributions. Optimization of quadratic forms, Principal Component Analysis, North et al.'s "Rule of Thumb,". Canonical Correlation Analysis, Discriminant Analysis, associated sampling distributions. Vector Autoregressive Models, cross validation, power spectrum analysis, Predictability. Functions of Real Variables. Differential and Integration Calculus and their applications. Error analysis, Interpolation and approximations. Vector analysis : Dot and Vector product, Curl Divergence of Vector fields. Matrices and its application in solving Meteorological problems. Decomposition of Meteorological parameters into Mean and turbulent parts. Tensor analysis. Review of numerical methods relevant to Meteorological applications: Finite-differences and derivative expressions in terms of forwards, backward and centred differences; implicit and semi-implicit formulations. Solution of differential equations with given boundary conditions using the FORTRAN language. Time series analysis and filtering techniques.

MET 812: Advanced Instrumentation and Environmental Measurements (2Units)

Basic instrumentation in Meteorology. Techniques of laboratory and field research in atmospheric and environmental science (Air sampling devices. pollutant measurements). Routine and Research measurements. Calibration method for different instruments. Measurements and sources of errors. Data acquisition and analysis. Principles and operations of the following instruments. LIDAR (Light Detector and Range). RADAR (Radio Detector And Range). SODAR (Sound Detector and Range). Multi- filter radiometers. Pollutant measurements by DOAS systems.

MET 813: Water Resources Systems (3 Units)

Hydrological cycle. Precipitation estimates and measurements. Spatial and temporal variations. Groundwater and aquifer characteristics. Surface water measurements of flow in natural channels, base flow and regression curves; storms. Vegetation and water balance. Hydrological forecasting, water resources systems. Identification and evaluation of water management plans; models and solution procedures, simulation and search methods. Probability concepts. Time series and stochastic processes. Systems with dynamic uncertainty. Confidence interval for Quantiles and moments. River basin modelling; streamflow and reservoir estimation. Flood control alternatives. Hydroelectric power production. Models syntheses multiple site river basin planning models. Irrigation planning and operation models water quality prediction and simulation; steady-state models of river and estuarine systems. Reliability of receiving water quality simulation models. Non-point-source pollution models. Lake quality management.

MET 814: Environmental Pollution and Controls (3 units)

Meso-scale circulation. Sources of Air pollution , Effect of Air pollution. Atmospheric Systems and Pollutant Transport. Regulatory Control of Air Pollution. Atmospheric Systems and Pollutant Transport. Chemical kinetics and atmospheric pollution dispersions. Air pollution meteorology and controls. Pollutant dispersion models. Guassian Diffusion models: practical application and their limitations. Numerical Dispersion Models. Urban and Regional Air Quality models. Corrosion and deterioration. Photochemical smog formation and ozone production in the boundary layer. Global warming. Regulatory Control ofAir Pollution. EPA Standards.

MET 815: Urban Meteorology and Climatology (3 units)

Local Climate (Land and sea Breeze). Building Climatology. The heat island. Flux parameters. Wind structures in urban areas. Humidity fields. Clouds and precipitation in urban areas. Urban flood control and Management. Models of urban temperature and wind fields. Human biometeorology. Climate and urban planning. weather forecasting for urban areas. Management of atmospheric resources. Climate modification. Econo-climate.

MET 816: Meso-Scale Meteorology (3 units)

Atmospheric scales of motion. Scaling analysis equations of motion applicable to meso-scale motions. Terrain-induced mesoscale systems and their dynamics: Sea-breeze,Katabatic and anabatic flow, Coastal jet, Forest breeze. Tropical meso-scale systems: vortices, shearlines. Thunderstorms/squall lines, cloud clusters, Mesoscale convective systems, Hurricanes, typhoons. The CISK and other mechanisms: Divergence and vorticity in tropical meso-scale disturbances. Energy source for meso-scale disturbances. Rainfall production by meso-scale disturbances. Application of numerical modelling to mesocale systems. Economic aspects of meso-scale systems.

MET 817: Air-Sea Interaction (2 Units)

Basic observations of the coupled ocean-atmosphere system: Mean conditions at the air-interface, seasonal cycle, intraseasonal variability, interannual variability. Equations of motion and valid approximations for the Ocean: Mixed layer theories (one dimensional); SST and surface fluxes; Shallow water model; Two layer model; Mid-latitude quasi-geostrophic approximation; Continuous stratification; Wind driven Ekman theory; equatorial undercurrent. Oceanic Waves (tropical and extra-tropical; Kelvin; coastal Kelvin; Rossby); beta dispersion; boundary reflections; equatorial adjustment; normal modes; response to remote forcing. Models of the Tropical Atmosphere: Hadley circulation; Gill model; Lindzen- Nigam model. Understanding the atmospheric response to sea surface temperature anomalies; clouds; convection; boundary layer. Interactions between the tropical Ocean and Atmosphere: Development of simple air-sea interaction model; Unstable interactions; Bjerknes-Wyrtki mechanism; Unstable modes (unstable Kelvin and Rossby waves). Theories for ENSO; Predictability and prediction of ENSO.

MET 818: Remote Sensing And Gis Application In Meteorology (3 units)

Electromagnetic radiation principles. Remote sensing of the earth surface utilizing the electromagnetic spectrum. History of aerial photography and aerial photography. Vantage point. Cameras, Filters and films. Element of visual interpretation. Photogrammetry. Microwave imagery from Airplane. Satellite and manned spacecraft platform. Remote sensing systems: multi-spectral, thermal infra red, active and passive microwave, optical sensors, RADAR and LIDAR. Remote sensing applications for meteorological parameters, vegetation (NDVI, ENVI, etc), water systems, urban landscape, soils, minerals and Geomorphology, SST and wind (e.g. QuickSCAT). Analysis and applications of remotely-sensed ocean-color data and relevant software packages (BILKO and SEADAS). Introduction to Geographyical information systems (GIS). GIS packages (IDRISI, Arcview etc) .GIS applications in urbanization, soil degradation, agricultural systems, land cover change, hydrology modeling and watersheding, human population distribution. Ground –truthing and pattern recognition. GIS applications in weather forecasting and TV presentation. Image interpretation, practical applications in earth science , and use of remotely sensed data in geographic information systems. Principles of image production and commercial offer, various spatial resolution available, image georeferencing techniques (GPS), image processing systems and techniques, methods for extracting useful thematic information (e.g. creation of a digital terrain model, land use image classification, multi-data studies)

MET 820 Term Paper

A term paper on a chosen topic on application of Meteorology to solve an industrial or societal problem will be presented by each student.

MET 899: Master's Thesis Research Project (12 Units)

A thesis on a subject related to any area of interest applicable to meteorology

C) Doctor of Philosophy

MET 999: Doctoral Research Project (12 Units)

Original research project, which must involve independent investigations in any of the listed fields, should make new and significant contributions to the understanding and knowledge of Meteorology. The report should be presented in form of a thesis using approved format. Every candidate must present, at least, two successful seminars before submission of PhD thesis report for examination.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF METEOROLOGY AND CLIMATE SCIENCE

S/N	NAME	POST	Area of Specialization
1	PROF. V. O. AJAYI	Professor	Numerical Weather Prediction
2	PROF. Z.D. ADEYEWA	Professor	Satellite Meteorology
3	PROF. T. E. OLOGUNORISA	Professor	Hydro climatology
4	PROF. K. O. OGUNJOBI	Professor	Air Pollution Meteorology
5	PROF. A.A. BALOGUN	Professor	Agro meteorology
6	PROF. E. C. OKOGBUE	Professor	Atmospheric Radiation and Climatology
7	PROF. 1. A. BALOGUN	Professor	Biometeorology and Urban Climate
8	PROF. A. OLULEYE	Professor	Air Pollution Meteorology
9	PROF. A. AKINBOBOLA	Professor/	Biometeorology and Urban Climate
10	PROF E.A. ADEFISAN	Professor	Numerical Weather Prediction
11	DR. R.A BALOGUN	Senior Lecturer	Satellite Meteorology
12	DR (MRS). B.M. DADA	Lecturer I	Agro meteorology
13	DR. M.C. OCHEI	Lecturer I	Air Pollution Meteorology
14	DR. I. E GBODE	Lecturer II	Numerical Weather Prediction

9.4.5 DEPARTMENT OF REMOTE SENSING AND GEOSCIENCE INFORMATION SYSTEM

POSTGRADUATE DIPLOMA (PGD) IN REMOTE SENSING AND GIS CURRICULUM

INTRODUCTION

The Department of Remote Sensing and Geoscience Information System (RSG) was established in 2009, in the School of Earth and Mineral Sciences of the Federal University of Technology, Akure. The Department achieved full accreditation and graduated its first set of students in 2014/2015 academic session. The postgraduate diploma (PGD) programme is designed to train graduate students for applications in oil and gas, space science and technology, groundwater, geological survey, hydrology, marine meteorology, solid mineral development, water resources exploration, environmental management, civil engineering, road planning and construction, dam site location, mass wasting, and among others towards employment in both public and private sectors of Nigerian economy. The programme also promotes self-employment and entrepreneurship in Remote Sensing and GIS acquisition techniques.

PROGRAMME PHILOSOPHY

The Postgraduate Diploma (PGD) programme is designed to meet manpower development in various domains that require remote sensing and GIS technologies. The programme aims to train graduates from a variety background to become knowledgeable in remote sensing and GIS concepts and principles.

The philosophy of the PGD programme in remote sensing and GIS is therefore to train graduates to acquire technical know-how for efficient and effective usage of remote sensing and GIS in various fields such as Geosciences, Survey, Forestry and Ecology, Meteorology, Hydrology, Aviation Industry, Civil Engineering, Marine, Water Resources Management, Forestry, Disaster Risk Reduction and Management, Geophysical and Geological Agencies, Urban and Regional planning authorities, demography commissions, among others.

PROGRAMME OBJECTIVES

The specific objectives of the programme are to:

i) Expose postgraduate students to current knowledge, researches and up-to-date methodologies in the field of Remote Sensing and GIS, with a view to enhancing their conceptual understanding of applications and relation to solving practical problems;

ii) Produce high-level manpower in the field of Remote Sensing and GIS for the sustenance of teaching and research in institutions of higher learning and other related establishments;

iii) Provide expertise relevant to the needs of public and private sectors and non-governmental organizations; and

iv) Provide robust professional training that enables an individual to be self-employed/self-reliant and be able to create jobs.

PROGRAMME JUSTIFICATION

The programme is designed for candidates who wish to make up for their deficiencies in their first degree to be able to pursue second degree programmes, and those who wish to incorporate spatial data into their activities. It is a gap-bridging programme for non-professionals in the geospatial sector who wish to have professional qualification in remote sensing and GIS.It will boost manpower development in the inclusion of spatial context to both the public and private sectors at the various levels of their daily routine.

ADMISSION REQUIREMENTS

Candidate seeking admission into the programme should possess any of the following qualifications:

i) B.Tech. in Remote Sensing and GIS of the Federal University of Technology, Akure or any other related discipline from a recognized University, with a minimum of Third Class degree.

ii) Higher National Diploma (HND) or its equivalent with a minimum of Credit pass in Remote Sensing and GIS or related discipline like Geosciences, Water Resources, Surveying, Forestry or Meteorology from Tertiary institutions.

In addition, an applicant may be required to undergo a selection processas a condition for admission.

PROGRAMME DURATION

The PGD programme shall run for a minimum of three semesters on full-time basis.

GRADUATION REQUIREMENTS

Candidate will be required to complete 40 units, which consists of 34 units of course work and 6 units of project dissertation to qualify for the award of Postgraduate Diploma in Remote Sensing and GIS.

COURSE OUTLINE

First Semester

Course Code	Status	Course Title	L	T	P	U
RSG 701	C	Basic Principles of Remote Sensing	2	0	3	3
RSG 703	C	Database Systems	2	0	3	3
RSG 705	C	GIS and Spatial Data Analysis	2	0	3	3
RSG 707	C	Digital Image Processing and Interpretation	1	0	3	2
RSG 709	C	Web GIS	1	0	3	2
RSG 711	C	Principles of Cartography	1	0	3	2
RSG 713	C	Research Methodology	1	0	3	2
		Total				17

Second Semester

Course Code	Status	Course Title	L	T	P	U
RSG 702	C	Energy Resource Exploration	1	0	3	2
RSG 704	C	Earth Observation for Natural Hazard Assessment	1	0	3	2
RSG 706	C	Remote Sensing in Climate Studies	1	0	3	2
RSG 708	C	Geological Remote Sensing	2	0	3	3
RSG 710	C	Remote Sensing and the Environment	2	0	3	3
RSG 712	C	Earth Observation for Water Resource Studies	2	0	3	3
RSG 714	C	Field Mapping	0	0	6	2
		Total				17

Third Semester

Course Code	Status	Course Title	L	T	P	U
RSG 799	C	PGD Research Project	0	0	18	6
				Total		6

COURSE DESCRIPTION

RSG 701 BASIC PRINCIPLES OF REMOTE SENSING (3 UNITS)

Overview of remote sensing technology: history and evolution of remote sensing. Elements of remote sensing. Principles and characteristics of Electromagnetic Radiation. Laws of radiation (Stefan's Law, Kirchhoff's Law, Wien's Law, Planck's Law), Sources and propagation of electromagnetic radiation. The Electromagnetic Spectrum (basic principles, characteristics, and applications of electro-optical, microwave radar, and LIDAR remote sensing systems), Interaction with matter (atmosphere and targets). Spectral reflectance curves characteristics of Images. Properties of the atmosphere, constituents, contaminants, lapse rate, clouds, atmospheric sounding, Scattering mechanisms, temporal variations; albedo, reflection, Snell's law, absorption, photoelectric effect, insulation. Remote Sensing systems: active and passive systems, imaging and non-imaging systems;

General overview of airborne remote sensing: Photography, imaging instrumentation and procedures; advantages and applications.

Earth observation satellites: Sensors used in earth observation satellites; their Spectral, radiometric and geometric characteristics; Satellite characteristics;

Multispectral scanning; Thermal imaging; peculiarities and advantages of different sensors. Classification of satellites by orbit, applications, advantages and disadvantages; Types of observation, orbital dynamics.

RSG 702
ENERGY RESOURCE EXPLORATION (3 UNITS)

Introduction to Energy system and resources. Energy sustainability and the environment. Quantifying energy and energy arithmetic. Fossil fuels-past, present and future. Remedies and alternative for fossil fuels. Integrating various exploration datasets such as geophysical, geochemical, geological, radiometric, borehole and mineral data. Exploration concept model spatial database building. Generation of mineral potential maps. Mining closure and reclamation, oil and gas spillage.

RSG 703
DATABASE SYSTEMS (3 UNITS)

Definition of database;Overview of Database Management System; Definition of database system; Uses of Database; Data independence, relational system and others.Database system Architecture: Levels of architecture (external level, conceptual level and internal level); Mappings; Database management system (concepts and design, overview of networking, functions and architecture of DBMS, Distributed relational database design (data allocation & fragmentation), Transparencies in DBMS, Object-Oriented DBMS, Object-Relational DBMS. Introductionto relational databases: Relational model (Domains, Relations and base relvarsand views); Optimization; Catalog; and Transactions. Database languages:Introduction to SQL. Database Design: Conceptual database design, logical database design for relational model (concept of entity-relationship model, structural constraints, Problems with ER Models); physical database design, Normalization (Purpose of normalization, Data redundancy and update anomalies, Functional dependence, semantic modeling).Web Technology and DBMS, Data warehousing, OLAP and Data Mining.

RSG 704 EARTH OBSERVATION FOR NATURAL HAZARD ASSESSMENT (2 UNITS)

General concept of Hazards: Definitions of hazards and hazard assessment, hazard types and their spatial/temporal characteristics and triggering phenomena (e.g. spatial occurrence, duration of event, time of onset, frequency, magnitude, secondary events); Climate change and hazards: impacts of climate change scenarios on natural hazard. Concept of occurrence, probability, frequency, analysis and assessment based on historical data using statistical methods, Selection of suitable hazard assessment methods considering the hazard type, scale, and data availability; Hazard assessment study. Risk Assessment: causal factors for disasters, Evaluation of disaster databases. Components of risk assessment: concepts of elements at risk (buildings & population) in relation to different types of hazard, sources for the mapping of elements at risk, basic elements at risk database, generation of an element at risk database for an urban area; Vulnerability analysis: main approaches used for flood, earthquake and landslide; concepts of Spatial Multi Criteria Evaluation for vulnerability assessment; Risk Analysis: procedures for GIS-bases loss estimation and modeling, qualitative risk assessment combining hazards, exposures and vulnerability, obtaining spatial data useful for risk assessment; Evaluation of different spatial, spectral and temporal characteristics of different data types for risk assessment. Case studies on risk analysis.

RSG 705 GIS AND SPATIAL DATA ANALYSIS (3 UNITS)

Characteristic and types of GIS data: types of data; concepts of information. Maps and projections: Principles of cartography, ellipsoids, cartographic projections, coordinate systems, types of scales; accuracy of maps. GIS models; GIS components; inputs to GIS; GIS outputs and visualization; accuracy of data and integration errors in GIS. Overview of GIS computer packages. Cartographic Communication and Visualization (Graphic Symbology, Graphic Variables, Issues in Map Design, Text placement, Visualization of 3D data,

Spatial Data Modeling and Spatial interpolation: Surface representation methods, simple weighted interpolation from point samples, Kriging, Areal interpolation.

Measurement, retrieval and classification: Measurement, spatial selection queries, classification, and Overlay functions: Vector Overlay operations, raster overlay operations

Neighborhood function: Proximity analysis (buffer zone, Thiessen polygon), diffusion computation, flow computation, Raster-based surface analysis (slope angle and aspect calculation, hill shade, cut and fill, automatic catchment delineation)

Network analysis: Optimal-path finding, Network partitioning, Network allocation, Trace Analysis. Raster based overlay analysis: weighted overlay analysis, raster algebra.

RSG 706
REMOTE SENSING IN CLIMATE STUDIES (3 UNITS)
Review of principles of atmospheric radiation and their implications in remote sensing systems: electromagnetic spectrum, forms of energy transfer, atmospheric emission, Stefan-Boltzmann Law, Planck's radiation Law. Wien's Displacement Law, etc. The radar equation, spherical particles - limits and resolution. Doppler radar; Doppler spectrum and shift frequency, Attenuation; Use of Doppler radar for precipitation measurements -rainfall amount and intensity over an area. Interpretation of Doppler PPI displays; Measurement of turbulence, updraft velocities, size distribution and wind speed. Physical principles of earth satellite and their sensors, radiometers, limits of resolution, Spectral channels, weighting functions, analogue and digital image: Image enhancement and feature extraction, etc. Interpretation of satellite imagery (infrared and visible images) for the identification of upper-level features, wind, contour and streamline patterns, jet-streams, ridges and troughs, vertical distribution of moisture, surface weather, etc. Inversion of CO_2 emission data. Effects of local influences; Uses of satellite information in weather forecasting, dust haze occurrence and movement; drought occurrence.

RSG 707
DIGITAL IMAGE PROCESSING AND INTERPRETATION (2 UNITS)
Introduction to digital image processing. Fundamentals of computers and image processing systems. Hardware for image processing, types and characteristics. General overview of software packages available for processing. Configuration, choice and selection of images. Resolution description, demonstration and discussion of spatial, spectral and temporal resolutions, improvement strategies in resolution Integrated image analysis. Image structure and processing; Procedure and processes involved in image restoration and enhancement. Information extraction strategies. Fundamentals of image rectification and registration. Image enhancement techniques: Contrast stretching, edge enhancements and filtering, spectral ratioing. Ground truth data collection, use of radiometer, spectrophotometer and spectroradiometer. Principles of image classification and supervised classification, unsupervised classification, classification accuracy, digital elevation model. Intensity, hue and saturation transformation and image fusion techniques; Texture analysis – instrumentation and processes involved.

RSG 708
GEOLOGICAL REMOTE SENSING(3 UNITS)
An overview of remote sensing in geology, Elements/keys of image interpretation in geologic information extraction. Aerial photo/Satellite image interpretation; in visual interpretation of lithological units and structural analysis. Digital image processing for geologic information extraction using multispectral data: band ratioing, principal component analysis (PCA), independent component analysis (ICA), false colour composite. Digital image processing for automated structural information extraction. Application of microwave remote sensing data in structural interpretation. Filtering, edge enhancement, edge detection. Hyper spectral remote sensing for mineralogical mapping and mineral exploration. Spectral reflectance curves of rocks and minerals. Application of thermal infrared remote sensing in geothermal resources exploration and assessment. Acquisition and processing of structural geological field data for presentation on maps and images. Gamma ray spectrometry. Presentation of geochemical data using GIS. Geological data integration for mineral prospecting: Fuzzy overlay and weighted overlay.

RSG 709
WEB GIS (2 UNITS)
Spatial Data Infrastructure: Components; Standards; SDI Architecture; Meta-data: Categories; SDI nodes; Geo- web services: OGC Web service standards; Web-portals; Cloud GIS; Internet; World Wide Web; Web Mapping; Internet GIS; Web Server. Mobile GIS and its applications.

RSG 710
REMOTE SENSING AND THE ENVIRONMENT(3 UNITS)
Environmental Impact Assessment (EIA), waste management, coastal management. Introduction to Environmental Science and Management. Environmental Treaty, conventions and laws. Urban planning and management. Coastal zones: Definition, concepts and issues. Forest resources management. Environmental Health. Environmental Modelling and Monitoring. Pollution studies. Environmental conservation and sustainable development. Land use and Land cover studies.

RSG 711
PRINCIPLES OF CARTOGRAPHY (2 UNITS)
Fundamentals of Cartography, Geospatial data presentation. Role of maps in digital environment. Maps as output. Digital landscape modelling. Digital

cartographic modelling. Representation of graphic variables. Principles and procedures of Map design. Factors influencing map design. Cartographic symbols. Measurement levels. Interpretation of maps at both quantitative and qualitative levels. Application of cartographic design. Use of graphics software for mapping processes. Visualization. Visual variables. Types of visual perception. Principles of generalization: Guideline to generalization, Generalization process, Conceptual and graphic generalization. Automatic generalization using ArcGIS. Representation of dynamic variables: Representation of changes; single static map, multiple static map, animated dynamic map, dynamic visualization variables. Map layout: Objectives of map layout; components of map layout.

RSG 712
EARTH OBSERVATION FOR WATER RESOURCE STUDIES (3 UNITS)
Principles of remote sensing in geohydrological mapping and groundwater exploration. Significance of geological mapping of rocks and structural discontinuities and their hydrological properties in groundwater exploration. Significance of geomorphological mapping of different landforms (drainage, inselbergs, pediments, structural hills, erosional valleys) and their hydrological properties in groundwater exploration. Groundwater indicators on remote sensing data: features associated with recharge zones; features associated with discharge sites; Spectral characteristics of water bodies in different wavelength bands, change detection of lake geometry, evaluating sediment load in water bodies. Remote sensing applications in groundwater exploration and recharge estimation. Controlling factors: soil moisture; vegetation; topography; landforms; depth of weathering and regolith; geological structures, drainage characteristics. Groundwater management: Water level measurements, study of water table fluctuations and seepage patterns; Artificial recharge and rain water harvesting; Groundwater resources estimation and quality. Groundwater pollution and potential hazard mapping, salinity hazard mapping. Application of remote sensing in estimating hydrological parameters. Hydrological characteristics of drainage basins.

RSG 713
RESEARCH METHODOLOGY (2 UNITS)
Research Skills: Conceptual and research frameworks. Critical reading: Abstracting and reviewing scientific research papers. Scientific writing and argumentation. Inference and argumentation in various scientific disciplines. Literature search, citation and bibliography; use of library resources and personal bibliographic database. Ethics and professionalism in science.

RSG 714
FIELD MAPPING (2 UNITS)
Field mapping and ground-trothing training class: Mapping techniques, collection of region/area of interest (ROI/AOI) for image classification. Independent mapping exercise will be carried out in selected parts of Nigeria. Students are expected to map alone with minimal supervision. A comprehensive report on this exercise must be written and submitted at the end of the exercise.

RSG 799
PGD RESEARCH PROJECT (6 UNITS)
Students will carry out research in their areas of interest and will be supervised by relevant members of staff. The subject of study must be related to any aspect of applications in the Department.

MASTER OF TECHNOLOGY (M.TECH.) IN REMOTE SENSING AND GIS CURRICULUM

INTRODUCTION

The Department of Remote Sensing and Geoscience Information System (RSG) was established in 2009, in the School of Earth and Mineral Sciences of the Federal University of Technology, Akure. The Department achieved full accreditation and graduated its first set of students in 2014/2015 academic session. The Master of Technology (M.Tech.) programme is designed to adequately train graduate students in advance remote sensing and GIS techniques to address real-world problems in diverse areas such as oil and gas, space science and technology, groundwater, geological survey, hydrology, marine meteorology, solid mineral development, water resources exploration, environmental management, civil engineering, road planning and construction, dam site location, mass wasting, and among others towards employment in both public and private sectors of the global economy. The programme also promotes self-employment and entrepreneurship through knowledge acquisition in advance Remote Sensing and GIS methodologies.

AVAILABLE OPTIONS

The following options are available in the Master of Technology (M.Tech.) in Remote Sensing & GIS:

i) Earth Resources Exploration

ii) Natural Hazards & Disaster Risk Management

iii) Geoinformation Science

iv) Natural resources Management

PROGRAMME PHILOSOPHY

The Master of Technology (M.Tech.) in Remote Sensing and GIS is designed to provide advance theoretical, and practical training in the applications of Remote Sensing and GIS to solving various geologic, natural and anthropogenic related problems such as search for economic minerals, environmental, groundwater and engineering site investigations, hydrocarbon and solid minerals exploitation, archeological investigation and geological mapping. The products of this programme will therefore be suitable for employment in oil and oil-related industries, water boards or corporations, mineral industry, environmental and engineering establishments, the civil service and institutions of higher learning. They can also be self-employed.

PROGRAMME OBJECTIVES

The specific objectives of the programme are to:

i) Expose postgraduate students to current knowledge and up-to-date methodologies in Remote Sensing and GIS with a view to enhancing their conceptual understanding of applications and relation to solving practical problems;

ii) Produce high-level manpower in the field of Remote Sensing and GIS for the sustenance of teaching and research in institutions of higher learning and other related establishments;

iii) Provide expertise relevant to the needs of public and private sectors; and

iv)Provide robust professional training that enables an individual to be self-employed and job-creating.

PROGRAMME JUSTIFICATION

Remote Sensing and GIS is an emerging area of specialization that is required in the identification, assessment and management of environmental issues. Hence, remote sensing and GIS provides powerful solutions to real-world problems using most-advanced technologies such as the Internet, Global Positioning System (GPS), Global Navigation Satellite System (GNSS), Unmanned Aerial Vehicle (UAV), Satellite, Spectro-radiometeramong others, offering the chance to gain critical theory, develop strong practical skills and undertake supervised independent research, all under the guidance of competent and experienced staff. Therefore, proper understanding of availability of natural resources (i.e. renewable and non-renewable) and man- made disasters like flooding, landslide, tsunamis volcanic eruption, and earthquake known to have wreaked havoc on humanity can be achieved by the use of remote sensing and GIS. Combining cutting edge research in satellite remote sensing and GIS, this innovative Master's degree shall open the door to successful careers in environmental consultancy firms, software companies, government research institutes and postgraduate research degrees to help the candidate's ambition fulfilled.

ADMISSION REQUIREMENTS

Master of Technology (M.Tech.) Degree

Candidates seeking admission into the Master of Technology (M.Tech.) degree programme must possess any of the following qualifications:

(i) First degreein Remote Sensing and GIS or other related disciplines with minimum of Second Class Lower

Division of the Federal University of Technology, Akure (FUTA) or any other recognized approved Universities,
(ii) First degree in Remote Sensing and GIS or other related disciplines with Third Class plus a PGD in Remote Sensing with minimum of Upper Credit,
(iii) HND in related field with minimum of Credit pass plus a PGD in Remote Sensing with minimum of Upper Credit.

PROGRAMME DURATION

The M.Tech. programme shall run for minimum of 18 months and maximum of 24 months on a full-time basis.

GRADUATION REQUIREMENTS

Candidates will be required to complete minimum of 49 credit units depending on option, 12 units of thesis research project included to qualify for the award of M.Tech. in Remote Sensing and GIS.

COURSE OUTLINE

First Semester (Compulsory Courses for all Options)

Course Code	Course Title	L	T	P	U
RSG 801	Fundamentals of Earth Observation and GIS	1	0	3	2
RSG 803	Advanced Image Analysis and Quantitative Remote Sensing	2	0	3	3
RSG 831	Advanced Cartography	1	0	3	2
RSG 833	Research Methodology in Remote Sensing and Geoscience Information System	2	0	0	2
	Total				9

Earth Resources Exploration Option

Course Code	Course Title	L	T	P	U
RSG 805	Geological Systems	2	0	3	3
RSG 807	Remote Sensing for Earth Resources Mapping	2	0	3	3
RSG 809	Reflectance Spectroscopy of Rocks and Minerals	2	0	3	3
	Total				9

Natural Hazards & Disaster Risk Management Option

Course Code	Course U	Title L	T	P	
RSG 811	Introduction to Natural Hazards and Disaster Management	2	0	3	3
RSG 813	Global Climate Change	2	0	3	3
RSG 815	Risk Assessment	2	0	3	3
	Total				9

Geoinformation Science Option

Course Code	Course Title	L	T	P	U
RSG 817	Database Systems	2	0	3	3
RSG 819	Spatial Data Modelling and Processing	2	0	3	3
RSG 821	Fundamentals of Object Oriented Programming Language	2	0	3	3
	Total				9

Natural Resources Management Option

Course Code	Course Title	L	T	P	U
RSG 823	Fundamentals of Natural Resources Management	2	0	3	3
RSG 825	Geoinformation and System Analysis for Natural Resources Management	2	0	0	2
RSG 827	Natural Resources Mapping and Monitoring	2	0	3	3
RSG 829	Integrated Surface Water Resource Assessments	2	0	0	2
	Total				10

Second Semester (Compulsory Courses for all Options)

Course Code	Course Title	L	T	P	U
RSG 802	Spatial Data Infrastructure I	1	0	3	2
RSG 804	Image Interpretation for Earth Sciences	2	0	3	3
RSG 806	Independent Field Mapping	2	0	3	3
RSG 808	Graduate Seminar	0	0	6	2
	Total				10

Earth Resources Exploration Option

Course Code	Course Title	L	T	P	U
RSG 810	Geospatial Data Integration	2	0	3	3
RSG 812	Earth Resource Exploration	2	0	3	3
RSG 814	Geophysical Imaging and Geochemical exploration	2	0	3	3
	Total				9

Natural Hazards and Disaster Risk Management Option

Course Code	Course Title	L	T	P	U
RSG 816	Empirical Modelling of Hazard Processes	2	0	3	3
RSG 818	GIS-based Environmental Impact Assessment	2	0	3	3
RSG 820	Natural Disaster Risk Reduction	2	0	3	3
	Total				9

Geoinformation Science Option

Course Code	Course Title	L	T	P	U
RSG 822	Spatial Data Acquisition and Processing Techniques	2	0	3	3
RSG 824	Geovisualization and Web GIS	1	0	3	2
RSG 826	Spatial Data Infrastructure II	1	0	3	2
RSG 828	Principles of Spatial Data Quality	1	0	3	2
	Total				9

Natural Resources Management Option

Course Code	Course Title	L	T	P	U
RSG 830	Modeling Environmental Resources Dynamics	2	0	3	3
RSG 832	GIS in Land Resources Management	2	0	3	3
RSG 834	Environmental Hydrology and Coastal Zone Management	2	0	0	2
	Total				8

Third Semester (Compulsory Course for All Options)

Course Code	Course Title	L	T	P	U
RSG 899	Master's Thesis Research Project	0	0	36	12
	Total				12

COURSE DESCRIPTION

RSG 801: FUNDAMENTALS OF EARTH OBSERVATION AND GIS (2 UNITS)

Electromagnetic radiation and its properties, EM interactions with the Earth's atmosphere and Earth's surface. Characteristics of Remote Sensing Images, Types of Sensors, Examples of Remote Sensing satellites and data, Remote sensing platforms, Thermal imaging, Georeferencing, Visual Photo/image Interpretation. Overview of Basic Concepts, Spatial Data Types & Representations: Geographic Object & Geographic Field, Spatial data modelling (Tessellation, vector, ER, OO), Logical Design of Databases: Relational Database model, Determining and mapping position: Data Quality, spatial referencing, measures of location error on maps, satellite -based positioning. Data Entry and Preparation, Spatial data input, spatial data analysis, data visualisation.

RSG 802

SPATIAL DATA INFRASTRUCTURE I (2 UNITS)

Definition and characteristics of Spatial Data Infrastructure (SDI); Evolution of SDI; Components of SDI: Clearinghouse, Metadata Concepts, roles and functionality, Metadata management and update. Data sources, data sharing and related issues. National Geospatial Data Infrastructure (NGDI) and issues related to its deployment. Importance of Geostatistics in Earth Sciences, Geostatistical Prediction, Geostatistics versus Simple Interpolation. Limitations, Probability Distribution, Central Limit Theorem, Spatial Analysis: Conventional analysis, Data Posting, Symbol map, indicator map, moving windows. Spatial Continuity Analysis: Variogram, h–scatterplot, Model-fitting, Global Estimation, Local Estimation, and Probabilistic Estimation. Ordinary Kriging, Co-kriging, Geostatistical Simulation. Geodata analysis using R-Statistics.

RSG 803

ADVANCED IMAGE ANALYSIS AND QUANTITATIVE REMOTE SENSING (3 UNITS)

Introduction to principal geo- and hydro-meteorological hazards, Overview of remote sensing principles and method categories to identify and characterize those hazards, Digital image pre- processing for hazard assessment and monitoring, Introduction to advanced remote sensing methods, laser scanning, radar and thermal remote sensing and their applicability for hazard identification and assessment, Image-based change detection for natural hazard monitoring, Image-based post-disaster damage mapping, Introduction to advanced image analysis methods, such as object-based image analysis (OBIA).

RSG 804

IMAGE INTERPRETATION FOR EARTH SCIENCES (3 UNITS)

Principles of visual image interpretation for earth sciences, Use of multi-source RS image data (e.g. multispectral images, digital elevation models. LIDAR, RADAR, TIR for visual image interpretation, Geological image interpretation, Terrain analysis, Refresher mineralogy and petrology, Lithological image interpretation, Image interpretation of geological structures, Image interpretation of landforms (structural, denudation, fluvial, coastal), Optimal: image interpretation using gamma-ray data, Optional: image interpretation of surface processes.

RSG 805

GEOLOGICAL SYSTEMS (3 UNITS)

Ore-forming, geothermal and hydrocarbon systems. Major processes involved in the origin and formation of ore minerals, geothermal and hydrocarbon energy systems. Conceptual models of geological, mineralogical and chemical characteristics of selected geological systems. Global plate tectonics. Surface processes, such assoil formation and weathering, and their effects on surface expressions of geological systems.

RSG 806

INDEPENDENT FIELD MAPPING (3 UNITS)

Independent field mapping (lasting between 4 and 6 weeks) will be carried out in the selected parts of Nigeria. A comprehensive report of this exercise must be written and submitted to the department for grading.

RSG 807

REMOTE SENSING FOR EARTH RESOURCES MAPPING(3 UNITS)

Interaction of light and matter, Spectral measurements and sensor design, Atmospheric and geometric correction of image data, Data quality assessment, noise and error corrections, Absorption feature analysis and knowledge-driven spectral targeting, Statistical spectral matching and classification methods, Thermal anomaly detection for geothermal energy, Greenfield mapping of unexplored territory, Geological interpretation of surface compositional maps, Semi-quantitative mapping methods (unmixing, regression analysis), Expert system classification.

RSG 808
GRADUATE SEMINAR (2 UNITS)

Each candidate shall independently (but with the guidance of his/her supervisor) review literatures related to his/her choice of research topics. Students shall be given the opportunity to present their literature reviews and possibly new research areas in their related choice of topic. After a satisfactory review and identification of recent development and research gaps, a comprehensive seminar shall be presented and submitted for grading.

RSG 809
REFLECTANCE SPECTROSCOPY OF ROCKS AND MINERALS

Introduction reflectance spectroscopy, Absorption and scattering of EM-radiation, the reflection and absorption processes: Emittance. Causes of absorption: electronic
processes, crystal field effects, charge transfer absorptions, Conduction Bands. Spectra of rocks and other materials, Spectra of mixed materials, Field spectrometers, Field spectra sampling, analysis and
Interpretation of spectra. Hyper spectral Imaging: principles and platforms; Data processing and analysis. Hyper spectral mapping methods. Applications: alteration minerals mapping.

RSG 810
GEOSPATIAL DATA INTEGRATION (3 UNITS)

Definition of data. Evaluating data and data sources. Extraction and transformation of data. Data fusion. Identification and location of appropriate and cost-effective data source(s) for a given task or project. Evaluation of accuracy, precision, and currency of data. Open Geospatial Consortium (OGC), Interoperability standards, spatial databases, spatial queries, Metadata and data quality, advanced spatial analysis, Stereo viewing / 2.5 and 3-dimensional visualization techniques. Potential legal and ethical problems related to data use.

RSG 811
INTRODUCTION TO NATURAL HAZARDS AND DISASTER MANAGEMENT (3 UNITS)

Natural and man-made disasters; concepts and models of environmental hazards, hazard prediction and risk perception in disaster management, disaster theory, risk management, policy issues and dimensions in disaster management; Hazard mapping, assessment and mitigation; Early warning systems (mapping of flood, erosion, deforestation and earthquake vulnerability); Vector and raster analysis in disaster management.

RSG 812
EARTH RESOURCE EXPLORATION (3 UNITS)

The courses consists of a project assignment that deals with a specific geological exploration problem of which the terms of reference are provided to the students. The assignment will be carried out by analyzing the problem, planning and carrying out activities that typically involve the application of knowledge and skills that were acquired in previous courses. The focus of the project assignments can be chosen from a series of topics that are provided. Typically the project work involves the use of remote sensing data and other geosciences data that has to be interpreted and integrated within an exploration context. Problems that need to be solved in these projects are for instance related to the creation of geological base maps from poorly mapped areas or the selection of target areas that are prospective for certain mineral deposits or geothermal resources.

RSG 813
GLOBAL CLIMATE CHANGE (3 UNITS)

Anthropogenic changes; Climate forcing agents; study of climate sensitivity using simplified climate models. Climate change detection and distribution; Impacts and vulnerability; IPCC assessment reports and scenarios, climate downscaling and up scaling, regional impact studies, knowledge of past/future patterns of climate; Global Monitoring Techniques Climate Change defined Elements for assessment of roles of Science in Earth Observation; Role of Space-based platform and Trends. Current state of Climate Science; Climate extremes, warning systems and climate disaster risk management/reduction, Drought, Desertification Disasters and Risk Reduction; Ecosystem, livelihoods and Disasters – the new thrust on mitigation and Adaptation. Climate impacts on floods.

RSG 814: GEOPHYSICAL IMAGING AND GEOCHEMICAL EXPLORATION (3 UNITS)

General principles of geochemical dispersion processes during ore and rock forming processes, dispersion processes at or near the earth surface in the regolith environment and surface drainage, water, gas and sediments. sampling in the field and choice of analytical methods of chemical analysis ,laboratory use of appropriate instruments after total, partial or selective sample decomposition and through practical training in geochemical data handling as well as data plotting, overview of all geophysical methods and in particular the field methods, airborne geophysics, including magnetics, electromagnetics, gamma ray spectrometry and gravity.

RSG 815
RISK ASSESSMENT (3 UNITS)
Risk assessment overview, Elements at risk assessment, Vulnerability assessment; including spatial multi-criteria evaluation, Risk estimation: Qualitative and quantitative risk assessment, GIS-Damage assessment, Cost-benefit analysis, Overview of risk management, Water management in Nigeria. Life cycle assessment, impact assessment and risk assessment and how these can be used to measure sustainability. The format will include discussions on sustainability, assessment methods and sustainability assessment, including scoping, sustainable levels, inventory, impact and risk assessment and mitigations measures.

RSG 816
EMPIRICAL MODELLING OF HAZARD PROCESSES (3 UNITS)
Modeling overview, Generation of historical event databases for hazardous processes, Frequency analysis of extreme events (e.g. rainfall, discharge and other processes), Select and prepare factor maps as input for empirical modeling of hazard susceptibility, Spatial Multi-Criteria evaluation techniques for knowledge driven modeling, Statistical methods that correlate past events with causal factors, Convert susceptibility maps into hazard maps, Validation methods.

RSG 817
DATABASE SYSTEMS (3 UNITS)
Database concepts. Database management systems and development. Relational data model, set theory and predicate logic as a foundation for database querying: Relational query languages. Database querying using SQL, Data log, SQL, QBE, Triggers, Embedded SQL, Recursion. Database maintenance, Introduction to database design. Web database programming, Conceptual data modeling, E/R data model, OO data model, Relational database design, XML, XPath and XQuery. Ontology and Data Model. Semantic Web. Storage and indexing, Query processing and optimization,
Parallel and distributed databases, NoSQL databases. Current developments in knowledge base. Big data.

RSG 818
GIS-BASED ENVIRONMENTAL IMPACT ASSESSMENT (3 UNITS)
Definition of Environmental Impact Assessment (EIA). Purpose of EIA. Identification of driving forces, Impact assessment of changes in driving forces, Data availability, data collection and data quality assessment, Basic concepts of decision theory and problem structuring; Methodological steps in Multicriteria Analysis and Structured Multicriteria Analysis: Value Function and Weight Assessment;Criteria Aggregation;Sensitivity Analysis; Detection in space and time of changing driving forces, Building of future scenarios, Sensitivity analysis of engineering and hazard models, Impact assessment of potential change scenarios.

RSG 819
SPATIAL DATA MODELLING AND PROCESSING (3 UNITS)
Spatial databases and spatial data standards, Object-relational modeling using UML, Transformational design, ODD protocol, Agent-based simulation, Geocomputation. Introduction to geospatial modeling and interpretation, Raster data and Matrix application: Addition, subtraction, multiplication, Identity and Inverse for Spatial analysis concept; Raster and Vector data Geometry and Intensity transformation using Principle Component Analysis: Eigenvectors and Eigen values; Applications of GIS models; Geospatial models – types and Modelling: Descriptive, prescriptive and predictive; Normalization, level of measurement, Spatial analysis concept: Distance,
Adjacency, Interaction and Neighborhood; Introduction to modeling & flowcharting, Map algebra-operators &operations, Functional operations, Spatial interaction models; Point Analysis: Coordinate, Distance – Nearest Neighbor Distance, Density – Quadrant and other methods, Clustering - K- mean,Thiessen and Buffer, Address Geocoding, Optimum Routing Closest facilities, Resource Allocation, Network Analysis; Dynamic Segmentation: Route, Section, Events and its application;
Local neighborhood operation – Reclassification, filter, slope, Aspect, curvature, view shed

RSG 820
NATURAL DISASTER RISK REDUCTION (3 UNITS)
Hazard and risk assessments. Framework for hazard reduction. Key risk reduction elements and spatial data, Risk perception and risk evaluation, Risk governance, Risk communication, Risk visualization, Risk reduction measures, disaster preparedness and planning, cost benefit analysis; awareness and education; mitigation; preparedness for emergency response, recovery, and reconstruction; prediction and dissemination of warnings; strategies for learning from disasters; and international cooperation,strategies for disaster reduction.

RSG 821
FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING LANGUAGE (3 UNITS)
Introduction to Object-Oriented Programming, Object-Oriented Analysis and Design, Introduction to Unified Modeling Language, Unified Modeling Language Architecture, User View, Actor Identification, System

User View Design, Structural View of a System, Class Diagram Creation, Object Diagram Creation, Behavioral View of a System, Collaboration Diagram Creation, Implementation View of a System, Component Diagram Creation, Environment View of a System, Deployment Diagram Creation.

RSG 822
SPATIAL DATA ACQUISITION AND PROCESSING TECHNIQUES (3 UNITS)

Coordinate transformations, Sensors for data acquisition: Digital aerial cameras, very high resolution satellite sensors and GPS, Orientation of acquired images by indirect and direct georeferencing, Derivation of standard topographic products from the images: digital terrain models, digital ortho-images and topographic databases. Automated processing of Images. Image segmentation, Image classification including sub pixel and fuzzy methods, Image matching including area-based and feature-based methods.

RSG 823
FUNDAMENTALS OF NATURAL RESOURCES MANAGEMENT(3 UNITS)

Natural resources and natural resources management, Actors and objectives in natural resources management, Conflicts and participation in Natural Resources Management problem situations, Problem Structuring in Natural Resources Management, Case of multi-sector Natural Resources Management planning in the Nigeria, Introduction to disciplinary approaches and information requirements in Natural Resources Management conflict situations, Introductory statistics.

RSG 824
GEOVISUALIZATION AND WEB GIS (2 UNITS)

Principles of visualization of spatio-temporal data in a desktop or web environment, Maps, cartography and geo-visualization, Cartographic data analysis and design guidelines, Thematic and topographic maps, Time and maps, spatio-temporal data exploration. Concepts and techniques for the creation and use of web services, the geo-information value chain (providers, developers and consumers), Open systems: principles and standards, Services technology (Distributed computing & Service oriented architecture), Web application design, Server- side and client-side programming.

RSG 825
GEOINFORMATION AND SYSTEM ANALYSIS FOR NATURAL RESOURCES MANAGEMENT (3 UNITS)

Land use/cover classification concepts, agro-ecological zoning, Biodiversity conventions and consequences, Landforms, major land resource areas, including soil and terrain characteristics, Global forest resource assessment, Food security issues and governance, Framework(s) for assessing Natural Resources Management policies and interventions, Problem and systems analysis and application in a chosen field, Assessment of information requirements, Assessment of existing spatial databases, Data quality assessment and evaluation, Analysis of data flows and interactions between data users and producers, Interactive data dissemination and geo-portals, Design of an information system with a spatial database, Application of geo- information for the analysis of natural systems, such as: Problem analysis and problem structuring, Systemand situation analysis including organizational setting, Ecosystems analysis, Livelihood concept and analysis, Farming systems analysis, Natural resources degradation analysis, Introduction to basic statistical inference and its application, Introduction to scientific argumentation, Introduction to planning and decision support systems.

RSG 826
SPATIAL DATA INFRASTRUCTURE II (2 UNITS)

Existing status for spatial data. SDI components and their nature. Factors that influence the SDI development Clearinghouses of different generations. Inter-operability and International standards for these. Introduction to service composition. Cartographic aspects of geo-portals.
SDI modelling and evaluation. The spatial activated the society ("spatial-enabled society"). Geodata Policy and Plan (for a single organization). Basics of geomatic economics, The Law of Geodata, Technology for geodata publishing using the Internet, including Geography Markup Language (GML), Web Map Server (WMS), and Web Feature Server (WFS).

RSG 827
NATURAL RESOURCES MAPPING AND MONITORING (3 UNITS)

Regression analysis for RS based modelling of image characteristics and natural or cultural ecosystem properties, Sampling statistics for (field) data collection, Analytical/physical based/quantitative mapping techniques, focusing on the relation between image characteristics (optical, laser, and microwave remote sensing) and image based indices(like NDVI) on the one hand and spatial/temporal object properties on the other, Spectral characteristics of natural surfaces (natural and agricultural vegetation, soil), RS based indices as measure of the properties of forests, crops, natural vegetation and other land cover types, Hyper-spectral remote sensing for

mapping, Radar remote sensing for mapping, LIDAR remote sensing for mapping, Multi temporal remote sensing for mapping, Hyper-temporal remote sensing for mapping, with emphasis on hyper- temporal NDVI images, Time scales; Variability in ecosystems and change events. Sequential mapping and change detection, Radiometric, atmospheric and geometric correction, Land cover change detection (bi temporal vs. continuous time scale change detection, visual vs. digital change detection, direct mathematical image differences, image regression, post classification change detection, change detection algorithms), Sequential mapping and error propagation.

RSG 828
PRINCIPLES OF SPATIAL DATA QUALITY (2 UNITS)
Introduction to Spatial Data Quality (SDQ), Definitions of SDQ, Key components of SDQ, Quantitative mathematical and statistical analysis: Basic concepts in probability and statistics, Basic calculus for geoinformatics students, exploratory data analysis, Linear regression and least squares, Non-linear regression and non-linear adjustment, Hypothesis testing and confidence intervals, Positional uncertainty, Attribute uncertainty (including thematic uncertainty, scale issues and Modelling and Uncertainty Propagation (MAUP): Error propagation, Accuracy assessment and validation of spatial datasets and model outputs.

RSG 829
INTEGRATED SURFACE WATER RESOURCE ASSESSMENTS(2 UNITS)
Integrated water resource modelling, generic aspects (e.g. time-space representation, model initialization),specific (numerical boundary conditions and calibration) aspects of modelling, model design and building, model performance assessments, Aspects of catchment system and process representation, model parameterization, time-space scales, model error propagation and uncertainties, model applications including modelling in data scares areas, watershed modelling, stream flow modelling, water balance closure, rainfall-runoff modeling, flood modelling. Use of earth observation data of water cycle variables such as rainfall, evapotranspiration and soil moisture, In-situ data collection.

RSG 830
MODELLING ENVIRONMENTAL RESOURCES DYNAMICS (3 UNITS) Correlation and simple, multiple and curvilinear regression analysis, Logistical regression, Collinearity. Predictive and dynamic process modelling: Spatial Multi Criteria Evaluation (SMCE), Cellular Automata (CA) and Agent Based Models (ABM), Dynamic land use modelling,
Species distribution modelling.

RSG 831
ADVANCED CARTOGRAPHY(2 UNITS)
Introduction to Map Design and Production, Map Scale, Coordinate and Projection System, Map Generalization, Symbolization, Map Accuracy, Visualization, Layout Design and Presentation, Symbol Creation, Cartographic Modeling, Customized Template Design. Creating isocline and other terrain representations, interpolation, classificationschemes, multivariate representation and representation of data uncertainty.

RSG 832
GIS IN LAND RESOURCES MANAGEMENT(3 UNITS)
GIS applications in land resource management; Nature and purpose of land evaluation, procedure and planning of Land evaluation, land use requirements, land utilization types, matching land use with land, Environmental impact, social and economic analysis mapping land use changes; Land use/land cover demarcation using GIS; land degradation/risk and constraint map generation; demonstration of GIS technology in land use/land cover (LULC) assessment.

RSG 833
RESEARCH METHODOLOGY IN REMOTE SENSING AND GEOSCIENCE INFORMATION SYSTEM (2 UNITS)
The scientific enterprise and the postgraduate student. Logic and structure of scientific research; Inference in various scientific disciplines; Literature search, citation and bibliography; Conceptual and research frameworks; Abstracting and reviewing scientific research; Structured scientific writing and argumentation; How to structure a postgraduate research proposal; Ethics and professionalism in research; Research quality and thesis assessment; Structuring results, discussion and conclusions; Graphic presentation in a thesis.

RSG 834
ENVIRONMENTAL HYDROLOGY AND COASTAL ZONE MANAGEMENT(2 UNITS)
Introduction to water quality & eco-hydraulic modelling: advective, dispersive, reactive hydrologic transport phenomena; mathematical solutions of the transport equations; application to surface water and soils; model

building using Excel and R-code, exposure to hydro geochemical, water quality model codes (Phreeqc, Otis, Sobek/Duflow, Swat), in-situ water quantity& quality monitoring field experiments (flow, water quality assessment and model data acquisition) in Regge &Dinkel area; exposure to laboratory analysis. Water quality remote sensing: spectral signatures of waters; inherent optical properties; radiative transfer; atmospheric and water interface corrections; algorithms; forward and inverse model retrievals. Field excursion with in-situ spectral data collection for water quality studies. Integration of in-situ, remote sensing data with models for spatial analysis of water resources. General knowledge on coastal areasand coastal resources, distribution, status and importance of coastal resources to environment. Wetland Ecology and Management, Coastal Climate Vulnerability and Resilience, Remote sensing and GIS Application in Coastal Management, Climate Change and Coastal Management, Sustainable Management of Coastal Margins, Coastal Erosion Modeling and Management.

RSG 899

MASTER'S THESIS RESEARCH PROJECT(12 UNITS)

Students will carry out in-depth study in any area of Remote Sensing and GIS applicationswithin the scope of the programme and will be supervised by staff. The thesis will be subjected to defence as stipulated in the regulations of the School of Postgraduate Studies. Students are expected to work independently under the supervision of his or her supervisor throughout the research.

DEPARTMENT OF REMOTE SENSING AND GEOSCIENCE INFORMATION SYSTEM

DOCTOR OF PHILOSOPHY (Ph.D.) IN REMOTE SENSING AND GIS CURRICULUM

INTRODUCTION

The Department of Remote Sensing and Geoscience Information System was established in 2009, in the School of Earth and Mineral Sciences of the Federal University of Technology, Akure. The Department achieved full accreditation and graduated its first set of students in 2014/2015 academic session.

The Doctor of Philosophy (PhD) programme is designed to train high-level manpower and technical managers in advanced remote sensing and GIS techniques to address real-world problems. Big geospatial and temporal data has become infused into many aspects of our daily lives. Analysis of such data is used in diverse areas such as oil and gas, space science and technology, groundwater, geological survey, hydrology, marine meteorology, solid mineral development, water resources exploration, environmental management, civil engineering, road planning and construction, dam site location, mass wasting, and among others towards employment in both public and private sectors of the global economy to better understand and manage natural and built environments. In response, worldwide expenditures on geospatial technologies are large and rapidly increasing. The programme also promotes entrepreneurship through knowledge acquisition in advanced Remote Sensing and GIS methodologies and those willing to attain the highest level of formal academic training and ultimately take up teaching and other career jobs.

AVAILABLE OPTIONS

Doctor of Philosophy (PhD) in Remote Sensing & GIS in the following options are available:

i) Earth Resources Exploration
ii) Natural Hazards & Disaster Risk Management
iii)Geoinformation Science
iv) Natural Resources Management

PROGRAMME PHILOSOPHY

The PhD in Remote Sensing and GIS is a research-based programme which culminates in a unique thesis that demonstrates original and creative research. As a research-oriented degree, the Ph.D in Remote Sensing and GIS prepares exceptional students for careers at the cutting edge of academia, industry and government. With a highly individualized structure of study, the programme provides students with in-depth knowledge in their chosen research area coupled with a rigorous breadth of the art of Remote Sensing and GIS. Upon the completion of the

programme, students are able to set their own research direction, teach and advice students, and work at the forefront of cutting-edge research in academia or in the industry.

PROGRAMME OBJECTIVES

The main goal of the PhD programme is to develop high-level manpower in the field of Remote Sensing and GIS for the public and private sectors, and in particular building capacity for institutions of higher learning and related research organizations.

The specific objectives are to:

i) Expose students to current knowledge and up-to-date methodologies in Remote Sensing and GIS, with a view to enhancing their conceptual understanding of applications and relation to solving practical problems;

ii) Produce high-level manpower in the field of Remote Sensing and GIS for the sustenance of teaching and research in institutions of higher learning and other related establishments;

iii) Provide expertise relevant to the needs of public and private sectors and non-governmental organizations; and

iv) Provide robust professional training that enables an individual to be self-employed and job-creating.

PROGRAMME JUSTIFICATION

The PhD programme will enable Masters' holders who are eligible to apply and undergo further research training that will lead to PhD degree in Remote Sensing and GIS. It will provide an opportunity for the Department (RSG) and the University (FUTA) to produce future crops of lecturers and researchers in Remote Sensing and GIS, and equip them for teaching and research in institutions of higher learning and research organizations. It will also provide manpower development for the public and private sectors of the Nigerian economy.

ADMISSION REQUIREMENTS

Candidate seeking admission into the programme should possess any of the following qualifications:

i) M.Tech. (Remote Sensing and GIS) degree of the Federal University of Technology, Akure with at least 3.50 on the 5-point CGPA scale;or

ii) M.Tech./M.Sc. degree of any other recognized institution with a CGPA of at least 3.50 on the 5-point CGPA scale or a weighted average of 60% and above;

iii) Candidates seeking admission into the PhD programme must also meet the basic University admission requirements.

PROGRAMME DURATION

The PhD degree programme shall be for a minimum of 36 months and maximum of 48 months on full time basis, and a minimum of 48 months and maximum of 60 months on part time basis.

GRADUATION REQUIREMENTS

To be eligible for the award of the Doctor of Philosophy degree in Remote Sensing and GIS, a candidate must have:

i) pass all courses recommended (if any) by the Departmental Postgraduate Committee;

ii) Present at least three seminars (proposal, progress and final);

iii) Fulfilled all other conditions as prescribed by the Board of School Postgraduate Studies of the University; and

iv) Successfully completed and defended a research thesis in an oral exanimation.

RSG 999 PhD THESIS RESEARCH PROJECT

Students will carry out in-depth study in any area of applications of Remote Sensing and GIS within the scope of the programme and will be supervised by qualified staff. The thesis will be subjected to defense as stipulated in the regulations of the School of Postgraduate Studies. Students are expected to work independently under the supervision of his or her supervisor throughout the research.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF REMOTE SENSING AND GEOSCIENCE INFORMATION SYSTEM (RSG)

S/N	NAME	STATUS	SPECIALIZATION	E- MAIL	PHONE
1	Prof. Suleiman. Abdul-Azeez. Adegboyega	Professor	Remote sensing and GIS, Environmental Management, Environmental Impact Assessment and Coastal Zone Management	saadegboyega@futa.edu.ng	08035012873
2	Prof. Adeleye Yekeen Abiodun Anifowose.	Professor	Remote sensing and Hydrogeology/Engineering Geology	aybanifowose@futa.edu.ng	08036670047
3	Prof. Francis Omowonuola Akinluyi	Professor	Remote sensing and GIS, Geophysics, Groundwater exploration, Engineering site investigation and Pollution mapping	foakinluyi@futa.edu.ng	08033596566
4	Prof. Matthew Olomolatan Ibitoye	Professor	Remote sensing and GIS, Urban Geomorphology and Environmental Management	moibitoye@futa.edu.ng	08034730290
5	Dr.Sunday Olukayode Oladejo	Reader	Remote sensing and GIS, Spatial epidemiology and disease ecology	sooladejo@futa.edu.ng	08137770123
6	Dr. Akinola Adesuji Komolafe	Senior Lecturer	Environmental Remote sensing, Waste disposal site mapping and Geological remote sensing, Surface and subsurface modelling in GIS	aakomolafe@futa.edu.ng	08037899856
7	Dr. A. M. Fapo	Lecturer II			08039440388
8	Dr. D. R. Awoniran	Lecturer II			08163403411

9.5 SCHOOL OF ELECTRICAL SYSTEMS ENGINEERING (SESE)
9.5.1 DEPARTMENT OF COMPUTER ENGINEERING (CPE)

1. PROGRAMME OFFERED

a. Post Graduate Diploma (PGD)
b. Masters of Engineering (M.Eng.)
c. Doctor of Philosophy (Ph.D.)

2. AVAILABLE OPTIONS / SPECIALIZATION

i. Software System Engineering
ii. Data Communication and Networking
iii. Artificial Intelligence
iv. Robotics and Automation

3. PHILOSOPHY & OBJECTIVES OF PROGRAMME

a. Post-Graduate Diploma

To provide an opportunity for advanced professional education and training in Computer Engineering for:

i) those who wish to upgrade their technical knowledge in the profession without necessarily seeking advanced research-oriented degrees;
ii) those who wish to make up for the differences in their academic background to satisfy the requirements for the practice of engineering, and
iii) those who wish to bridge their academic career from practical-oriented Higher National Diploma course to the more theoretical research-based studies in the university and subsequently pursue higher degree courses from one university degree programme, e.g. a B.Eng. (Mechanical Engineering) degree holder wishing to do an M.Eng.(Computer Engineering) may do the PGD(Computer Engineering) and on a successful completion, go ahead and register for the M.Eng.(Computer Engineering).

The programme is designed to enable, amongst others, successful candidate to attempt and pass relevant professional examinations to facilitate registration as a practicing professional engineer in Nigeria. Those who complete the PGD course with a minimum of 4.0 grade point average (Second Class Upper) and requisite qualifications as stipulated by Senate can also proceed to higher degrees.

b. Master of Engineering (M.ENG) Programme

The Bureau of Labour Statistics projects that the field of computer and information technology will add more than 500,000 new jobs by 2026, an increase of 13%. In addition to strong job prospects, qualified IT professionals command median salaries of ₦400,000; computer hardware engineers topped ₦500,000. The most specialized, lucrative positions in this industry require a Master's degree in computer engineering or related area.

i. These Master's programmes combine theoretical instruction in concepts like probability, wireless communication, and system engineering with practical skill development related to circuitry, digital signals and embedded system. With a Master's degree, you will have the requisite training to enter and advance in computer engineering and information engineering.
ii. A computer engineering degree equips you with the skills and knowledge necessary to succeed in several professional roles, as a computer hardware engineer, system engineer, computer or information system manager, or academic researcher. All these roles demand strong analytical and problem-solving skills. The course contents included here are only relevant to conditions prevailing at the time of the preparation of this programme. The actual content will depend on circumstances and advances that are relevant to ensuring that the objectives of the programme are met.

Doctor of Philosophy (PhD)

The Ph.d programme is a research-centered one, which will depend on the background and prior preparedness of the candidate.

Candidates may be required to take as well as audit relevant courses in order to improve their capabilities especially in other disciplines.
The choice of research area will depend on availability of supervisors and other equipment.
Research will be conducted in topic that are relevant to the technological development of the country as well as contribute to technical knowledge in the fields of Computer engineering.

The PhD programmes also creates a research-based work for specific industry.

ADMISSION REQUIREMENTS
PGD

In addition to satisfying the minimum UTME requirement for admission to engineering programmes in the university, a candidate may possess any or a combination of the following:

i. A first degree with at least a 3rd class grade in Computer Engineering, Electrical Engineering, Mechanical Engineering and related engineering fields.
ii. HND with at least a Lower Credit pass in Computer Engineering, Electrical and Electronics Engineering and related engineering fields from a recognized Institution.

b. M.ENG

To be qualified for admission into the M. Eng. programme, candidates must satisfy appropriate requirements as stated below:

i) a bachelors degree in Computer Engineering, Electrical and Electronics Engineering, Information and Communication Engineering and related Engineering fields with at least a second class lower division from either The Federal University of Technology Akure (FUTA) or any other recognized university that runs COREN-accredited programmes.
ii) candidates with PGD in Computer Engineering, with at least CGPA of 4.0/5.0.

c. PhD

To be qualified for admission into the PhD programme, candidates must satisfy appropriate requirements as stated below:

i) an M.Eng. degree in Computer Engineering with a minimum score of 60% or 3.5/5.0 from either FUTA or any other recognized university that runs COREN-accredited Computer Engineering programmes; and obtained the qualifications tenable for admission into M.Eng. programme in Computer Engineering Department of School of Engineering and Engineering Technology, FUTA, is eligible to do the Ph.D programme,

ii) a candidate with M.Eng. in Electrical and Electronics Engineering, Information and Communication Engineering and other related Engineering fields will be required to take a minimum of 12 units in their area of proposed research to be admitted for Ph.D program in Computer Engineering.

5. DURATION OF PROGRAMME

a) PGD

The programme shall be for a minimum of four (4) semesters (24 months).

b) M. Eng.

The M. Eng. programme consisting of course work and research will normally last a minimum period of 18 months but not more than 24 months on full time basis.

c) PhD

The PhD programme is a research study lasting for a minimum period of 36-48 months full time or 48-72 months part-time students and may include course work.

6. REQUIREMENTS FOR GRADUATION

a. PGD

Each diploma student is required to successfully complete in four semesters, a minimum of 60 units of course works and 6 units of an independent project.

b. M.Eng.

In order to receive the M. Eng. degree, a candidate must successfully:

i. pass all courses selected from a buffet of course as specified in the course synopsis;
ii. present and pass two seminars based on a 12 credit load supervised thesis;
iii. submit the required number of copies of thesis;
iv. present proof of a minimum of one journal publication; and
v. pass the oral examination of the submitted thesis.

Where a student exhibits deficiency(ies) in any area, such a student may be required to register for, and pass appropriate course(s) recommended to make up for the deficiency(ies).

c. Ph.D.

In order to receive the Ph.D. degree, candidate must carry out an independent research work in his specialization under the general supervision of selected senior academic staff in the chosen field of research. The candidate must demonstrate high scholastic ability through the research work. The dissertation emanating from the research should exhibit originality and the result must form distinct contributions to knowledge. In carrying out this main requirement, a candidate must observe the following:

i. a candidate must, in consultation with his supervisors, present a comprehensive research proposal and a proposal seminar in the department and school successfully within the first year of study;
ii. as in c(i), a candidate must present a progress report and seminar in the department and school successfully;

iii. on completion of the research work, the candidate must present an end -of- thesis seminar successfully in the department and school;
   a. a candidate must present proof of minimum of two journal publications; and
   b. a candidate, after carrying out satisfactory post seminar review, must submit the required number of copies of thesis for oral examination; and pass satisfactorily the examination of the submitted thesis.

7. COURSE OUTLINES

a. PGD - FIRST YEAR

FIRST SEMESTER

Course Code	Course Title	L	T	P	Unit
CPE 701	Engineering Mathematics 1	2	1	0	3
CPE 705	Numerical Methods	2	1	0	3
EEE 711	Circuit Theory	2	1	0	3
CPE 707	Computer Graphics and Animation	2	1	0	3
CPE 703	Software Engineering	2	1	0	3
CPE 781	Laboratory Practical I	-	-	3	1
	Total				16

SECOND SEMESTER

Course Code	Course Title	L	T	P	Unit
CPE 702	Operating Systems	2	1	0	3
EEE 722	Artificial Intelligence	2	1	0	3
CPE 704	Digital Electronics	2	1	0	3
CPE 706	Robotics and Automation	2	1	0	3
CPE 708	Machine Learning with Python	2	1	0	3
CPE 782	Laboratory Practical II	-	-	3	1
	Total				16

PGD – SECOND YEAR

FIRST SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 703	Reliability Engineering	2	1	0	3
EEE 709	Engineers in Society	2	-	0	2
CPE 715	Prototyping Techniques	2	1	0	3
CPE 714	Digital Image Processing	2	1	0	3
CPE 718	Computer Organization and Architecture	2	1	0	3
CPE 783	Laboratory Practical III	-	-	3	1
CPE 789	Project I	-	-	3	3
	Total				18

SECOND SEMESTER

Course Code	Course Title	L	T	P	Unit
CPE714	Technical Report Writing	2	2	0	2
CPE 706	Engineering Law and Management	2	1	0	3
CPE 729	Data Communication and Network	2	1	0	3
CPE 726	Cyberpreneurship and Cyberlaw	2	1	0	3
CPE 710	Computer Security Techniques	2	1	0	3
CPE 799	Project II	-	-	3	3
	Total				17

b. M.ENG

i. Software System Engineering Option

FIRST SEMESTER

Course Code	Course Title	L	T	P	Unit
CPE 861	Artificial Intelligence: Prin. & Tech.	2	1	0	3
CPE 803	Object-Oriented Programming	2	1	0	3
CPE 805	Data Structures and Algorithm	2	1	0	3
CPE 807	Advance Software Engineering	2	1	0	3
CPE 809	Operating System Engineering	2	1	0	3
	Total				15

SECOND SEMESTER

Course Code	Course Title	L	P	T	Unit
CPE 802	Embedded System and IoT	2	1	0	3
CPE 804	Advance Image Processing	2	1	0	3
CPE 806	Randomized Algorithm	2	1	0	3
CPE 808	Advanced Natural Language Processing	2	1	0	3
CPE 810	Algorithm for Inference	2	1	0	3
	Total				15

Electives

Course Code	Course Title	L	P	T	Unit
CPE 811	Digital Integrated Circuit design	2	1	0	3
CPE 812	System Identification	2	1	0	3
CPE 813	Cloud Infrastructure and Computing	2	1	0	3
CPE 801	Engineering Mathematics	2	1	0	3

THIRD SEMESTER

Course Code	Course Title	L	P	T	Unit
CPE 897	Seminar	0	0	0	1
CPE 899	Master's Thesis Research Project	0	0	0	12
	Total				13

Electives

Course Code	Course Title	L	P	T	Unit
CPE 891	Engineering Management and Entrepreneurship	2	0	0	2

i. Data Communication and Networking Option

FIRST SEMESTER

Course Code	Course Title	L	T	P	Unit
CPE 861	Artificial Intelligence: Prin. & Tech.	2	1	0	3
CPE 803	Object-Oriented Programming	2	1	0	3
CPE 805	Data Structures and Algorithm	2	1	0	3
CPE 821	Data Communication Computer Networks	2	1	0	3
CPE 823	Networking and Computer Security	2	1	0	3
	Total				15

SECOND SEMESTER

Course Code	Course Title	L	P	T	Unit
CPE 802	Embedded System and IoT	2	1	0	3
CPE 822	Network Optimization	2	1	0	3
CPE 824	Distributed Algorithm	2	1	0	3
CPE 826	Advance Data Structure	2	1	0	3
CPE 828	Wireless Communication System	2	1	0	3
	Total				15

Electives

Course Code	Course Title	L	P	T	Unit
CPE 811	Digital Integrated Circuit design	2	1	0	3
CPE 855	Pervasive Human Centric Computing	2	1	0	3
CPE 801	Engineering Mathematics	2	1	0	3
CPE 878	Database System	2	1	0	3

THIRD SEMESTER

Course Code	Course Title	L	P	T	Unit
CPE 893	Seminar	0	0	0	1
CPE 899	Master's Thesis Research Project	0	0	0	12
	Total				13

Electives

Course Code	Course Title	L	P	T	Unit
CPE 891	Engineering Management and Entrepreneurship	2	0	0	2

iii. Robotics and Automation

FIRST SEMESTER

Course Code	Course Title	L	T	P	Unit
CPE 841	Math Methods for Decision Making in Engineering Systems	2	1	0	3
CPE 865	Introduction to Robotics	2	1	0	3
CPE 861	Artificial Intelligence: Prin. & Tech.	2	1	0	3
CPE 843	Electric Machines & Drives	2	1	0	3
CPE 845	Instrumentation & Industrial Control	2	1	0	3
	Total				15

SECOND SEMESTER

Course Code	Course Title	L	P	T	Unit
CPE 842	Robot Control & Design	2	1	0	3
CPE 844	Intelligent Robotics	2	1	0	3
CPE 868	Machine Learning	2	1	0	3
CPE 802	Embedded Systems & IoT	2	1	0	3
CPE 846	Robot Vision	2	1	0	3
	Total				15

Electives

Course Code	Course Title	L	P	T	Unit
CPE 811	Digital Integrated Circuit design	2	1	0	3
CPE 859	The Human Intelligence Enterprise	2	1	0	3
CPE 878	Database System	2	1	0	3
CPE 828	Wireless Communication System	2	1	0	3

THIRD SEMESTER

Course Code	Course Title	L	P	T	Unit
CPE 893	Seminar	0	0	0	1
CPE 899	Master's Thesis Research Project	0	0	0	12
	Total				13

Electives

Course Code	Course Title	L	P	T	Unit
CPE 891	Engineering Management and Entrepreneurship	2	0	0	2

IV Artificial Intelligence

FIRST SEMESTER

Course	Course Title	L	P	T	Unit
CPE 861	Artificial Intelligence: Principles & Tech.	3	0	0	3
CPE 862	Decision Making Under Uncertainty	3	0	0	3
CPE 865	Introduction to Robotics	3	0	0	3
CPE 867	Computational Logic	3	0	0	3
CPE 869	Natural Language Processing with Deep Learning	3	0	0	3
	Total				15

SECOND SEMESTER

Course Code	Course Title	L	P	T	Unit
CPE 863	Principles of Robot Autonomy	3	0	0	3
CPE 864	Natural Language Understanding	3	0	0	3
CPE 866	Probabilistic Graphical Models: Prin. & Tech	3	0	0	3

CPE 868	Machine Learning	3	0	0	3
CPE 870	Computer Vision: 3D	3	0	0	3
	TOTAL				15

Electives

Course Code	Course Title	L	P	T	Unit
CPE 871	CNN for Visual Recognition	3	0	0	3
CPE 859	The Human Intelligence Enterprise	2	1	0	3
CPE 878	Database System	2	1	0	3

THIRD SEMESTER

Course Code	Course Title	L	P	T	Unit
CPE 897	Seminar	0	0	0	1
CPE 899	Project	0	0	0	12
	Total				13

Electives

Course Code	Course Title	L	P	T	Unit
CPE 891	Engineering Management and Entrepreneurship	2	0	0	2

c. Ph.D

Course Code	Course Title	L	P	T	Unit
CPE 999	Doctoral Research Project (for Ph.D)	-	-	-	12

8. COURSE SYNOPSIS

a) PGD

CPE701 Engineering Mathematics I (3 Units)

Review of matrix operation including inversion, Eigen values, Eigen vectors and Canonical transformations and application. Three dimensional vector representations, vector calculus, gradient, divergence and curl line, surface and volume integrals, Laplacian operations. Greens, Stoke's and Divergence theorems and applications. Ordinary and partial differential equations, applications and physical problems. Complex variables, numerical analysis, special functions and integral, problem formulation, simple method of solution.

CPE702 Engineering Mathematics II (3 Units)

Complex variables: function, deviation, language series. Taylor series, Cauchy theorem, Cauchy formula, Cauchy integrals. Analytic functions, singular points, Residual problems, conformal problems and mapping. Special functions: Gamma, Delta, Beta and error functions. Fourier integral, Fourier transforms for solving partial differential equations.

CPE703 Software Engineering (3 Units)

Software Engineering Process: Extreme Programming, Software Design: Object oriented design with UML, Software Construction: OO coding practices, design patterns, refactoring, concurrency, aspect oriented programming, Software Testing: Integrated testing unit, Software Engineering Tools and Methods: formal specification techniques, design by contract, and tools, Applied software engineering: Testing, Debugging, Profiling, Coding standards, Documentation, Tools, Java.

CPE704 Digital Electronics (3 Units)

Review of Boolean Algebra and Logic Circuits Simplifications. Flip-flops. Counter, Registers, Memory, Devices, Semiconductor Technologies; MSI, LSI, etc. interface Digital converters, e.g. ADC, DAC series/parallel converter, etc. Microprocessors, Digital Test and Maintenance Equipment.

CPE705 Numerical Methods (3 Units)

Gaussian elimination, Gauss-Seidel methods and Newton Raphson iteration methods of solving linear equations. Forward and backward difference tables, central difference formula, Finite difference Solution to partial differential equations. Solutions of ordinary differential equations (1st and 2nd order) using Runge-Kutta method.

CPE706 Robotics and Automation (3 Units)

Robot classification and manipulation. Technology and history of development of robots. Applications. Direct and inverse kinematics: arm equation. Workspace analysis and trajectory planning. Differential motion and statics. Automation sensors. Robot vision. Automated assembly systems. Numerical and adaptive control, Automation in

inspection and testing. Linear feedback control system. Optimal Control.

CPE 707 Computer Graphics and Animation (3 Units)
Overview of 3D animation and its application and types. Coordinate system, vertex, faces and object. Concept of wireframe, surface and solid modelling. Construction planes and differences between object space and world space. Principle of making character alive. Polygonal Modelling Techniques. Nurbs Modelling Techniques. Graphics animation process. Animation Techniques. Dynamics animation. Tips and tricks on rendering. Concept of Rendering in 3D modelling. Render options and file output.

CPE708 Machine Learning with Python (3 Units)
Coding with Python. Tensor Flow and Algorithm Formulation. Supervise learning and Non-Supervise learning. Applications to Solution of Engineering Problems.

CPE 710 Computer Security (3 Units)
Introduction: Overview of computer security, attacks and services, control of hardware software. Usage. Intruders, Viruses and Worms: Intrusion techniques. Nontechnical attacks. Password protection and its vulnerability. Intrusion detection. Nature of viruses. Malicious programs. Types of viruses. Antivirus approaches. Worm propagation and countermeasures: access control, intrusion detection and firewalls. Disaster Recovery: Recovery requirements, policy, strategy, technical team. Execution of recovery plans. Documentation and backup system. Loss estimation. Developing Secure Computer System: External Security Measures, Issue, Security Models [Specification and Verification, Bell and LaPadulla Model, Clark-Wilson Model, Goguen-Meseguer, TCSEC], Discretionary Access Requirements, Mandatory Access Requirements, User Authentication, Access and Information Flow Control, Auditing and Intrusion Detection, Damage Control and Assessment, Microcomputer Security. Entropy, perfect secrecy, unicity distance, complexity theory, NP completeness, number theory. Cryptographic System, Public Key Systems, digital signatures. Network and Telecommunication Security: Fundamentals, Issue, Objective and Threats, Security Services, Distributed System Security, The Trusted Network Interpretation, TNI Security Services, AIS Interconnection Issues, Firewalls [Gateways, Application, Cost and Effectiveness .Database Security: Security Requirements to Databases, Designing the Security, Methods of Protection, Security of Multilevel Database .

CPE 714 Digital Image Processing (3 Units)
Introduction: definition, problems, and applications of digital image processing. Digital image acquisition devices. Digital image formats. Edge detection techniques, segmentation methods. Image Morphology. Image enhancement. Image restoration techniques. Morphology. Fourier transform and Wavelet transform in image processing. Image registration techniques. Shape analysis. Image understanding. Artificial neural network and image understanding. Colour representation standards, equations, processing, quantization, and dithering. Case study: practical application of image processing to face recognition, fingerprint, iris, etc. Introduction to image compression techniques.

CPE 715 Prototyping Techniques (3 Units)
Introduction: Grounding, ground plane, digital ground, analogue ground, power decoupling, inductance and capacitive effects, feedthrough capacitors. Soldering techniques for pass-through and surface mount components, desoldering. Breadboarding, veroboarding. Wire wrapping techniques. Radio Frequency design and implementation techniques. Printed Circuit Board techniques, and production of PCB. Use of PCB CAD packages. Construction exercises using different prototyping techniques.

CPE 718 Computer Organisation and Architecture (3 Units)
Computer Fundamentals: Development history of computer hardware and software. Hardwired vs stored program concept. Vorn-Neuman architecture. Havard architecture: principle of operation, advantages, disadvantages. Single address machine. Contemporary computers. Computer system: block diagram, functions, examples, dataflow, control line. Computer Arithmetic: integer arithmetic (addition, subtraction, multiplication, division), floating-point representation (IEEE), floating-point arithmetic. arithmetic and logic unit (ALU). Introduction to CISC and RISC architecture: principle of operation, merits, demerits. Storage and Input/Output Systems: Computer function (fetch and execute cycles), interrupts, interconnection structures (Bus structure and bus types), Overview of memory system, memory chip organization and error correction, cache memory, memory storage devices. Overview of I/O, programmed and interrupt-driven I/Os, DMA, I/O channel and I/O processor. Control Unit: Micro-operations, control of the CPU, hardwired implementation, control unit operation, micro-instruction sequencing and execution, micro-programmed control. Use INTEL family, and MOTOROLA family as case study of a CISC computer system. Instruction Set and Register: Machine instruction

characteristics, types of operands and operations, instruction functions, addressing modes, instruction formats, register organization, instruction pipelining. High performance computer systems: Techniques to achieve high performance, pipelining, storage hierarchy, Units with function dedicated for I/O. RISC, introduction to superscalar processor, parallel processor. Use popular RISC processor (e.g. i960, Motorola PowerPC) as case study. Operating System: Overview of operating system, dimension and type of operating system, high level scheduling, short-term scheduling, I/O scheduling, memory management, virtual memory, UNIX/LINUX operating system: architecture, commands, programming; window based operating systems (MS windows, X-window).

CPE 726 Cyberpreneurship and Cyberlaw (3 Units)
Introduction: Definition of creativity, innovation, examples of creativity leading to innovation, commercialization of creative and innovative ideas. Trends in technology development. Entrepreneurship management and ownership. Characteristics of entrepreneur, starting a new business, business planning, strategic planning & management, site selection and layout. Establishing new venture, risk management. Business Plan Development: definition, need, preparation of business plan. Forecasting developments and charting an action plan . Identifying the product/service, market research and feasibility study. Financing business. Sources of debt financing. Creating the marketing plan, pricing, creative advertising and promotion. Entrepreneurship case studies: Overview and analysis of successful entrepreneurs such as Bill Gates, Michael Dell, David Filo and Jerry Yang of Yahoo, etc. Nigerian Entrepreneurship: Discussion of Nigerian business environment, and illustrated with successful Nigerian entrepreneurs. Overview of the Nigerian Legal System: Civil and criminal. Basic concepts of law. Contract Law. . Current issues: digital signatures, Intellectual property and copyright. Speech Law: Defamation, Sedition, Printing Press Act. Speech on the Internet. Advertising Code: Made in Nigeria rules and guidelines, Advertising Standards. Media and Licensing law in Nigeria: Developing an in-depth understanding of the nature and function of Nigerian media law. Public and Private licensing. Intellectual and moralrights. Music royalties, synchronization rights, performance rights. Role of music publishers. Broadcast rights, merchandising. Detailed analysis of Communications and Multimedia Act. Ethic and Etiquette: New codes of social behaviour: the right to privacy.

CPE729 Data Communication and Network (3 Units)
Introduction to Data communication. Protocols. Error control and data compression. Local Area Networks. Client-Server Requirements. Information Network Software. Network Operating System. Internet.

EEE 703 Reliability Engineering (3 Units)
Introduction to reliability, maintainability, reliability specification and metrics. Application to computer hardware system, communication equipment, power systems, electronic components. Basic maintenance types, and procedures of computer and digital communication system. Fault troubleshooting techniques. QoS and time of availability of data communication. Quality control techniques. Design for higher reliability, fault tolerance. Software Reliability: software reliability specification, software reliability Metrics, fault avoidance, fault tolerance, programming for reliability, software safety and hazard analysis. Comparison of hardware and software reliability. Software Quality and Assurance: definition of software quality, software quality factors, quality control, cost of quality, quality assurance. SQA activities, formal technical reviews, software quality metrics, statistical quality assurance. ISO 9000 Requirements and Certification, ISO 9000-3 for software quality process, process documentation, quality audit. Capability Maturity Model: Software Engineering Institute, levels of maturity, key process areas, Comparison between ISO 9000 Standards and CMM. Ensuring Quality and Reliability: verification and validation, measurement tracking and feedback mechanism, total quality management, risk management.

EEE706 Engineering Law and Management (3 Units)
Principles of Management. Industrial group and organizational behaviour. Motivation. Industrial Law, legislation on wages, trade marks and patents, Laws of contract and sales of goods. Liability for industrial injuries. Industrial relations, trade unions, employer associations, wages bargaining and the role of the state. Relevant topics on entrepreneurship designed by the National Universities Commission for Nigerian Universities. Organization concepts; human resources management. Financial management. Production Management. Company Policy development strategies. Entrepreneurship. Patents, inventions. Trademarks and copyright.

EEE 711 Circuit Theory (3 Units)
Elementary signals. Dynamic circuit behaviour, oscillations. First and second order systems. Laplace and Fourier transforms. Time and frequency domain solutions of circuit equations. Stability. Transfer function concepts.

Applications of network theorems. Single-phase and three-phase circuits. Two-port network analysis, Introduction to computer-aided analysis. Applications of Laplace transform to transient analysis of RLC circuits. Non-sinusoidal periodic waveforms. Non-periodic signals. Different methods of network synthesis including Cauer, Foster, Long Division method, partial fractions, etc. Conditions for Reliability. Synthesis of nonlinear resistive circuits. Computer applications in the analysis and synthesis of linear and non- linear circuits

EEE 722 Electronics Devices and Systems (3 Units)
Diode Circuits. Analysis of Single. Stage Amplifier Circuits. Multi-stage Amplifiers. Oscillators- Power Supply Circuits. Wave-Shaping circuit, integrated circuits (ICs). OP Amps Circuits.

CPE781 Laboratory Practical I (1 Unit)
Computer Graphics and Animation Laboratory: Student will be assigned a specific project with emphasis on 3D graphics and Animation.

CPE782 Laboratory Practical II (1 Unit)
Embedded System Laboratory: Introduction to PIC and Arduino programming. Digital and Analog I/O, Digital Counter, LCD and Sensor application.

CPE 783 Laboratory Practical III (1 Unit)
Prototyping Techniques Laboratory: Student will be assigned a specific project with emphasis on fabricating a complete system such as an I/O, CPU, memory, etc. using PCB and other fabrication and prototyping techniques.

b. M. Eng. Course Synopsis

CPE 801 Engineering Mathematics
Complex Numbers, Ordinary Differential Equations (ODEs), Series, Multivariable Calculus, and Linear Algebra. The introduction to Ordinary Differential Equations and Series topics include direction fields, Euler's method, first order separable ODEs, first order and second order linear ODEs with constant coefficients, Taylor and Fourier series. Multivariable Calculus includes representation of functions of several variables, surfaces and curves in space, partial differentiation, optimisation, directional derivatives, gradient, divergence and curl, line integrals of the 1-st and 2-nd kinds, iterated integrals, Green's theorem. Eigenvalues and eigenvectors, and symmetric and orthogonal matrices. Engineering applications are discussed in each topic.

CPE 802 Embedded Systems and IoT
Introduction to Embedded Systems and Microcontroller-based Circuit Design, Instruction Set Architecture, C Programming Review and Dissection, C Start-Up Module and Simple Digital I/O, Analog to Digital Conversion, Disciplined Software Development, Serial Communications, Interrupt concepts and behavior and how to program with them in C, Interrupt-Driven Serial Communications and Sharing Data, Non-Preemptive Scheduling, Software Testing, Preemptive Scheduling, Process Coordination and Scheduling

CPE 803 Object Oriented Programming
Introduction to OOP: What is object oriented programming? Why do we need object oriented, Programming characteristics of object-oriented languages, C and C++, **C++ Programming basics :** Output using cout Directives. Input with cin, type bool, the set manipulator, type conversions. **Functions:** Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference. **Object and Classes :**Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor. Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes. **Arrays and string arrays fundamentals :** Arrays as class member data, Arrays of object, string, the standard C++ String class. **Operator overloading :** Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable. **Inheritance :** Concept of inheritance. Derived class and based class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation: Classes within classes, inheritance and program development. **Pointer:** Addresses and pointers. The address of operator and pointer and arrays. Pointer and Faction pointer and C-types string. Memory management -New and Delete, pointers to objects, debugging pointers. **Virtual Function:** Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information: **Streams and Files:** Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in file I/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, and printer output. **Templates and Exceptions:** Function templates, Class templates Exceptions

CPE 804 Representing and Modelling for Image Analysis

Subspace (Manifold) learning Theory: PCA Applications: Eigen faces, Active Shape & Active Appearance Models. Additional topics: kernel PCA, LLE, Boundary Detection Theory: Calculus of variations Applications: Mumford-Shah functional, snakes, level sets, EM Theory: EM algorithm Applications: segmentation, tracking, Graph algorithms Theory: Graph cut algorithms Applications: segmentation, stereo, Clustering Theory: hierarchical, k-means, spectral Applications: grouping in images, Graphical Models Theory: MRFs, inference in graphical models Applications: regularization, part/layer models, Shape descriptors Shape context, SIFT Medial axis, skeletons, Transformations and their manipulation Theory: diffeomorphisms, splines, Applications: shape representation, registration, Information Theoretic Methods Theory: entropy and mutual information Application: alignment, segmentation, Classification Theory: nearest neighbor, perceptron, Fisher Linear Discriminant, SVMs, Ada Boosting Applications: object detection/recognition

CPE 805 Data Structures and Algorithm

Preliminaries of algorithm, Algorithm analysis and complexity, Data structure- Definition, types of data structures Recursion: Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion, recursive algorithms for factorial function, GCD computation, Fibonacci sequence, Towers of Hanoi, Tail recursion. Searching Techniques: List Searches using Linear Search, Binary Search, Fibonacci Search. Sorting Techniques: Basic concepts, Sorting by: insertion (Insertion sort), selection (heap sort), exchange (bubble sort, quick sort), distribution (radix sort) and merging (merge sort) Algorithms. Stacks and Queues: Stacks: Basic Stack Operations, Representation of a Stack using Arrays, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions. Queues: Basic Queue Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues- Round, Robin Algorithm, Circular Queues, Priority Queues. Linked Lists: Introduction, single linked list, representation of a linked list in memory, Operations on a Single linked list, Reversing a single linked list, Advantages and disadvantages of single linked list, circular linked list, Double linked list. Trees: Properties, Representation of Binary, Trees using arrays and linked lists, operations on a Binary Tree, Binary Tree Traversals (recursive), Creation of binary tree from in, pre and post order traversals. Advanced concepts of Trees: Tree Travels using stack (non recursive), Threaded Binary Trees. Binary search, tree, Basic concepts, BST operations: insertion, deletion. Graphs: Basic concepts, Representations of Graphs: using Linked list and adjacency matrix, Graph algorithms. Graph Traversals (BFS & DFS), app1ications: Dijkstra's shortest path, Transitive closure, Minimum Spanning Tree using Prim's Algorithm, Warshall's Algorithm(Algorithemic Concepts Only, No Programs required).

CPE 806 Randomized Algorithms

Basic probability; the minimax principle; limited independence, More advanced concentration of measure: subgaussian and subgamma variables, Balls in bins; negatively associated random variables, Hashing: universal, perfect, cuckoo, Fingerprinting; Bloom filters, Network coding; edge connectivity, Graph sparsification, Parallel algorithms; symmetry breaking, Randomized approximation algorithms, Streaming algorithms, Stochastic gradient descent; SVRG, Random walks: cover times, Markov chains, mixing rates.

CPE 807 Advanced Software Engineering

Single page web application development (HTML5 | CSS3), JavaScript for Front-end (JavaScript | jQuery | jQuery-mobile), Front-end Frameworks (Bootstrap | Angular JS), Foundation paradigms (OOPS | Design Patterns | Object Modelling | JSON | AJAX), Backend integration, DISHA (Resume & Interview prep package)

CPE 808 Advanced Natural Language Processing

Introduction, Estimation Techniques, and Language Modeling, Parsing and Syntax, The EM Algorithm in NLP, Stochastic Tagging, and Log-Linear Models, Probabilistic Similarity Measures and Clustering, Machine Translation, Discourse Processing: Segmentation, Anaphora Resolution, Dialogue Systems, Natural Language Generation/Summarization, Unsupervised Methods in NLP.

CPE 809 Operating Systems Engineering

Operating Systems, PC Hardware and x86 Programming, Overview of Major Internals, System Call Interface, Virtual Memory, Interrupts, Exceptions, Multiprocessors and Locking, Processes and Switching, Sleep and Wakeup, File Systems, Crash Recovery, File System Performance and Fast Crash Recovery, OS Organization, Language / OS Codesign, Scalable Locks, Lock Free Coordination, Virtual Machines.

CPE 810 Algorithms for Inference

Directed Graphical Models, Undirected Graphical Models, Factor Graphs and Comparing Graphical Model types,

Minimal I-Maps, Chordal Graphs, Trees and markov Chains. Gaussian Graphical Models, Inference on Graphs: The Elimination Algorithm, Inference On Trees: Sum-Product Algorithm, Forward-Backward Algorithm, Sum-Product On Factor Graphs, Sum-Product On Factor Graphs, MAP Elimination, , The Max-Product Algorithm, Gaussian Belief Propagation, BP on Gaussian Hidden Markov Models: Kalman Filtering, The Junction Tree Algorithm, Loopy Belief Propagation and its properties, Variational Inference, Markov Chain Monte Carlo Methods and Approximate MAP, Approximate Inference: Importance Sampling and Particle Filters, Learning Graphical Models, Learning Parameters of an Undirected Graphical Model, Parameter Estimation from Partial Observations, Learning Structure in Directed Graphs, Learning Exponential Family Models.

CPE 811 Digital Integrated Circuit Design

Review of Boolean Algebra and Logic Circuits Simplifications. Flip-flops. Counter, Registers, Memory Devices, Semiconductor Technologies; MSI, LSI, etc. interface Digital converters, e.g. ADC, DAC series/parallel converter, etc.

CPE 812 System Identification

Introduction to System Identification, Stochatic vs. Non-stachastic Formulation, Random Variables and Stochastic Processes, Signals and Systems and Related Topics, Model Parameterization and Prediction, Impulse and Step Response, Correlation Methods, Spectral Analysis, Least Square Estimation, Statistical Analysis of LS Methods, Determining Model Dimension, Input Signals, Spectral Properties, Persistent Excitation, Parameter Estimation, Algorithms, Identification in Practice, Aliasing due to Sampling, Closed Loop Data, Model Order Estimation, Bounded but Unknown Disturbances, Optimal Algorithms, Optimal Inputs, Robustness Consideration, Adaptive Control, Certainty Equivalence.

CPE 813 Cloud Infrastructure and Computing

Definition and evolution of Cloud Computing Enabling Technologies, Service and Deployment Models Popular Cloud Stacks and Use Cases Benefits, Risks, and Challenges of Cloud Computing Economic Models and SLAs, Topics in Cloud Security, Historical Perspective of Data Centers, Data center Components: IT Equipment and Facilities Design Considerations: Requirements, Power, Efficiency,& Redundancy Power Calculations, PUE and Challenges in Cloud Data Centers Cloud Management and Cloud Software Deployment Considerations, Virtualization (CPU, Memory, I/O)Case Study: Amazon EC2Software Defined Networks (SDN) Software Defined Storage (SDS), Introduction to Storage Systems Cloud Storage Concepts Distributed File Systems(HDFS, CephFS) Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB) Cloud Object Storage(Amazon S3, OpenStack Swift, Ceph), Distributed Programming for the Cloud Data-Parallel Analytics with Hadoop MapReduce(YARN).

CPE 821 Computer Networks

Introduction and Network Models, Data and Signals, Digital and Analog Transmission, Multiplexing, Error Detention, and Data Link Control, Media Access Control and Ethernet, Network Layer and Next Generation IP, Data-Link and Network-Layer Protocols, Unicast and Multicast Routing, Wired Networks and Virtual LANs, Wireless Networks, Network Management and Firewalls

CPE 823 Networking and Computer Security

Terminologies and Abbreviations, Background, Threats to Communication networks, passive attacks, active attacks, potential network vulnerabilities, tapping into transmission media. Principles of encryption. Implementing encryption in networks. Integrity, Freshness, Authentication, Access Control

CPE 822 Network Optimization

Revision of linear algebra, the derivative matrix, basic conditions for local minimizers, Linear Programming, Convex sets, Convex functions, Convex Optimization problems, Lagrange Duality, KKT conditions Numerical optimization methods, Formulation of optimization problems in communications networks, Pareto optimality, Best responses and Nash equilibrium. Non-cooperative strategic and repeated games. Variational Inequality theory, Application of Game theory in communication networks

CPE 824 Distributed Algorithm

Introduction and types of distributed systems – Architecture of DS - Overview of processes - Taxonomy of Distributed Systems - scalable performance - load balancing and availability. Models of computation - shared memory and message passing system - synchronous and asynchronous systems. Communication in Distributed Systems - Remote Procedure Calls and Message Oriented Communications and implementation - High-level communication and publish-subscribe in Map reduce. Logical time and event ordering - Global state and snapshot algorithms - distributed snapshots in VMs - clock synchronization - Distributed mutual exclusion - Group based Mutual Exclusion - leader election - deadlock detection - termination detection - Distributed Databases -

implementations over a simple distributed system and case studies of distributed databases and systems - Distributed file systems: scalable performance, load balancing, and availability. Examples from Dropbox, Google FS (GFS)/ Hadoop Distributed FS (HDFS), Bigtable/HBase MapReduce, Consistency control: Data Centric Consistency - Client Centric Consistency - Replica Management - Consistency Protocols. Fault tolerance and recovery: basic concepts - fault models - agreement problems and its applications - commit protocols - voting protocols - check pointing and recovery. Case Studies from Apache Spark, Google Spanner, Amazon Aurora, Block Chain Systems etc.

CPE 826 Advanced Data Structures

Introduction to the analysis of algorithms, Review growth of functions and solving recurrences, Randomized algorithms and probabilistic analysis, Advanced sorting algorithms, Binary search trees, Red-black trees, Hashing, Heaps, binomial heaps and Fibonacci heaps, Amortized analysis, Graph algorithms, minimum spanning tree and shortest path algorithms, Dynamic programming, Greedy algorithms, String matching, Encryption, NP-completeness, Approximation algorithms

CPE 828 Wireless Communication System

Introduction to wireless networks, architectures and technologies, Wireless sensor network platforms: Hardware and Software, Communication architecture and protocols for WSN (MAC, Link, Routing), Energy management, Sensor data acquisition, processing and handling, Signal processing, target localization and tracking, self-organization, Modeling and Simulation of WSN, Application case studies (health, environmental monitoring, smart home)

CPE 841 Maths Method for Decision Making in Engineering Systems

Decision-making fundamentals: Contexts for decision making, Fundamental and means objectives, Measurement scales (nominal, ordinal, interval, and ratio). **Multicriteria decision making:** Analytic Hierarchy Process, Multiattribute utility theory, Swing weighting, SGroup decision making, Borda count, Kemeny-Young method, Majority judgement. **Uncertainty**: Aleatory and epistemic uncertainty, Assessing subjective probabilities. **Decision making under uncertainty**: Stochastic dominance, Decision trees, Modeling risk aversion, Expected utility. **Sequential decision making - Game theory**: Two-player zero-sum games, Mixed strategies for a zero-sum game, Mixed motive games. **Decision-making processes**: The incremental decision-making process, The contingency decision-making framework, Search, The secretary problem. **Value of information:** Expected value of perfect information, Expected value of imperfect information. **Risk management**: Risk treatment strategies, Potential problem analysis, Precursors, warnings, Receiver operating characteristic (ROC) curves, Risk communication. **Learning from failures**: Types of failures , Transforming failure information into knowledge sensitivity analysis

CPE 842 Robots Control and Design

Course organization; introduction to robot control, Robot components; mathematical representations of dynamical systems, Robot control architectures; time responses of dynamical systems; PID control, Locomotion; mobile robot control architecture, LTI systems; stability; output feedback and state feedback; pole placement, Controllability; observability; separation principle; optimal control, Hybrid systems; sliding mode control, Navigation, Manipulator kinematics and dynamics; PD control, Nonlinear control of manipulators, Adaptive control; reinforcement learning; cognitive robotics.

CPE 843 Electric Machines and Drives

Magnetic field produced by current-carrying conductors, Flux density and the flux linkage, Magnetic field structures with air gaps, Inductances, transformers, energy, The structure of DC machines, Operating principles of DC machines, DC-machine equivalent circuit, Various operating modes in DC-motor drives, Power-processing units in DC drives, Control objectives, Cascade control structure, Steps in designing the feedback controller, Controller design, Modeling with Simulink, Sinusoidally-distributed stator windings, Space vector, Space vector representation of combined terminal currents and voltages, Balanced sinusoidal steady-state excitation, The structure of permanent-magnet AC syn. Machine, Principle of operation, The controller and the Power-Processing Unit (PPU), The operation of induction motor, Tests to obtain the parameters of the per-phase equivalent circuit, Line start and soft start of induction motors, Conditions for efficient speed control over a wide range, Starting considerations in drives, Capability to operate below and above the rated speed, Speed control of induction-motor drives, Pulse-Width-Modulated Power-Processing Units, D- and Q- axis winding representation, Torque, speed, and position control, Sensor-less Drives, The principles of reluctance motors, Stepper-motor controller and drives

CPE 844 Intelligent Robots

Introduction: What is robotics, Robotics and AI, Embedded Systems, Agent-Task-Environment model,

Embodied Systems, Synthetic approaches to science. Sensors and signal processing: Common sensors and their properties, 1D signal processing, Vision.

Planning approaches to robot control: STRIPS and SHAKEY, Robot manipulator kinematics, Limitations of planning approaches. Control Theory: Feedback, feedforward and open loop control, Linear first order lag processes, Limitations of control theory. Probability Based Approaches: Markov Decision Processes (MDPs), Partially Observable Markov Decision Processes, Navigation. Behaviour-Based Control: The subsumption architecture, Hybrid architectures, Formalising behaviour based control (SMDPs). Adaptive approaches to robot control: Reinforcement learning for control, Model Based learning approaches to control, Learning maps, Evolutionary approaches. Case studies and applications

CPE 845 Instrumentation and Industrial Control
Solid State Devices Used in Industrial Logic Circuits; Programmable Controller (Allen Bradley Control Logix), Solid State Devices Used to Control Power SCRs, UJTs, TRIACs, Power Transistors; Solid State Devices Used for Firing Circuit; Photoelectronics, Lasers, and Fiber Optics; Input Devices: Sensors, Transducers, and Transmitters for Measurement {Active Transducers, Passive Transducers, Thermoresistive Transducers, Photoconductive Transducers, Humidity Transducers, Pressure Transducers, Flow Transducers, Level Determination, Speed Sensing, Vibration Transducers}; Signal Conditioning Circuitry, Output Devices: Amplifiers, Valves, Relays, Variable-Frequency Drives, Stepper Motors, and Servomotor Drives; Data Communications for Industrial Electronics, Telemetry, Industrial Robots

CPE 846 Robot Vision
Elements of Visual Perception, Image Sampling and Quantization, related Mathematical tools applied to Image Processing and Analysis (array, matrix, linear and non-linear operations, arithmetic and geometric operations, morphology, spatial and temporal operations, frequency analysis, linear algebra, probabilistic methods, image transformations and geometric operations) Image Formation: Camera Models, Calibration, Single view geometry, Multiple view geometry, Epipolar geometry, Feature extraction, Bundle adjustment Position and Orientation: Feature based alignment; Pose estimation; Time varying pose and trajectories, Structure from motion, dense Motion Estimation, Visual Odometry (Semi-direct VO, direct sparse odometry) Localization and Mapping: Initialization, Tracking, Mapping, geometric SLAM formulations (indirect vs. direct error formulation, geometry parameterization, sparse vs. dense model, optimization approach), Relocalization and map Optimization, Examples: Indirect (Feature based) methods (MonoSLAM, PTAM, ORB-SLAM), Direct methods (DTAM, LSD-SLAM), Sensor combinations (IMU, mono vs. Stereo, RGB-Depth), Analysis and parameter studies Recognition and Interpretation: Object detection, Instance recognition, Category recognition, Context and Scene understanding

CPE 861 Artificial Intelligence: Principles and Techniques (3 Units)
An introduction to the basic principles, techniques, and applications of Artificial Intelligence. Coverage includes knowledge representation, logic, inference, problem solving, search algorithms, game theory, perception, learning, planning, and agent design. Students will experience programming in AI language tools. Potential areas of further exploration include expert systems, neural networks, fuzzy logic, robotics, natural language processing, and computer vision.

CPE 862 Decision Making Under Uncertainty
Probabilistic models: probabilistic inference (Bayesian networks), decision making under uncertainty, and game theoretic models of multiagent interaction. Preferences and utility theory as a basis for "rational decision making" (including discussion of topics such as risk-aversion, multiattribute utility theory, and utility elicitation). Issues in multi-stage decision processes and planning. Markov decision processes (MDPs), both fully and partially observable, and several techniques developed in the AI community for solving these over the last few years, including those exploiting compact representations of systems (such as dynamic Bayes nets or factorial HMMs, function approximation techniques, etc). Simple reinforcement learning methods. Complications that arise in multiagent decision problems. Basic concepts in game theory: strategic form games, several forms of equilibria, simple coordination methods (e.g., learning, conventions, etc.). Mechanism design and certain elements of auction theory as an illustration of mechanism design and AI-based themes and computational issues that arise in such economic models. Voting theory, stable matching problems.

CPE 863 Principles of Robot Autonomy
Basic principles for endowing mobile autonomous robots with perception, planning, and decision-making capabilities. Algorithmic approaches for robot perception, localization, and simultaneous localization and mapping; control of non-linear systems, learning-based control, and robot motion planning; introduction to methodologies for reasoning under uncertainty, e.g., (partially observable)

Markov decision processes. Extensive use of the Robot Operating System (ROS) for demonstrations and hands-on activities.

CPE 864 Natural Language Understanding
Distributed word representations, Relation extraction with distant supervision. Natural language inference, Supervised sentiment analysis, Grounded language understanding, Semantic parsing, Contextual word representations (including updated coverage of BERT, RoBERTa, ELECTRA, and XLNet), Evaluation methods and metrics

CPE 865 Introduction to Robotics
Basics of Robotics and Linear Algebra, Matlab tutorial, representing positions and rotations, Rotational transformations and parameterizations of rotations, Homogeneous transformations, kinematic chains and DH convention, DH convention and forward kinematics. Inverse kinematics and angular velocity, Kinematics lab, Jacobian. Trajectory design and configuration space, Motion planning: potential field and PRM, Mobile robot, sensors and actuators

CPE 866 Probabilistic Graphical Models Principles and Techniques
Introduction, Probability Theory, Bayesian networks, Undirected Models, Learning Bayes Nets, Exact inference: message parsing, Sampling, MAP Inference: structured prediction, Parameter Learning, Bayesian Learning: structure learning, Exponential Families: variational inference, advanced topics and conclusions.

CPE 867 Computational Logic
Syntax and semantics of Propositional Logic, Relational Logic, and Herbrand Logic, validity, contingency, unsatisfiability, logical equivalence, entailment, consistency, natural deduction (Fitch), mathematical induction, resolution, compactness, soundness, completeness.

CPE 868: Machine Learning
Introduction, Inductive Classification, Decision Tree Learning, Ensemble Learning, Experimental Evaluation of Learning Algorithms, Computational Learning Theory, Rule Learning: Propositional and First Order, Artificial Neural Networks, Support Vector Machines, Bayesian Learning, Instance based Learning, Text Classification, Clustering and Unsupervised Learning, Language Learning.

CPE 869 Natural Language Processing with Deep Learning
Word vectors, Gensim word vectors example, Word vectors2 and Word Windows classification, Python Review, Backprop and Neural Network, Dependency Parsing, PyTorch Tutorial, RNN and Language Models, Vanishing Gradients, Fancy RNNs, Seq2Seq, Machine Translation, Attention, SubWord Model, Custom and Default, Transformers, Pretraining, Natural Language Generation, Reference in Language and Coreference resolution, T5 and large language models.

CPE 870 Computer Vision from 3D Reconstruction and Recognition
Introduction, Image Formation, Image Transformations, Lenses, Camera Calibration, Cameras with Lenses Introduction Stereo, Stereo, Epipolar Geometry, Stereo Essential and Fundamental Matrices. Repetition: Geometry of multiple Views, Correspondence: Multiview stereo, Triangulation. Multiview stereo, Rectification, Triangulation. Stereo, Triangulation, Correspondences, Stereo: Triangulation / 3D Reconstruction, Introduction: Reflectance Maps, Shape from Shading, Photometric Stereo, Shape from Shading: Surface Reconstruction, Optical Flow 1, Optical Flow II, Structure from Motion, Optical Flow III, Structured Lighting I, II, III, Shape from Silhouettes I, II, Range/Depth Image Processing, Kalman Filtering.

CPE 878 Database System
Introduction; database design and ER models, the relational model, relational algebra and SQL, storage and indexing, the logical-to-physical mapping; a key-value store, transactions, concurrency control, recovery and logging, semi-structured data and XML, object-oriented/object-relational models, distributed databases and replication, NoSQL and performance tuning.

CPE 891 Engineering Management and Entrepreneurship
Principles of Management. Industrial group and organizational behaviour. Motivation. Industrial Law, legislation on wages, trade marks and patents, Laws of contract and sales of goods. Liability for industrial injuries. Industrial relations, trade unions, employer associations, wages bargaining and the role of the state. Relevant topics on entrepreneurship designed by the National Universities Commission for Nigerian Universities. Organization concepts; human resources management. Financial management. Production Management. Company Policy development strategies. Entrepreneurship. Patents, inventions. Trade marks and copyrights.

CPE 897 Seminar
Supervisor will give topic to the students

CPE 899 Master's Thesis Research Project
Independent engineering project demonstrating professional maturity, performed under at least one supervisor, who is a senior academic staff.

c. Ph.D Course Synopsis

CPE 999 Doctoral Research Project
Presently, candidates may apply for work in the following research areas:

1. Software System Engineering - specialized Advanced software engineering, Operating system, Cloud Infrastructure;

2. Data Communications and Networking – Data structures, networking, wireless communication systems;

3. Artificial Intelligence - Machine Learning, Computer Vision, Embedded system;

4. Robotics and Automation - Robotics, System automation, Deep learning.

POSTGRADUATE LECTURERS IN THE DEPARTMENT OF COMPUTER ENGINEERING

S/N	Name	Status	Area of Specialization	e-mail address	Phone number
1.	Prof. E. O. Ogunti	Professor	Artificial Intelligence and Wireless Communication	eoogunti@futa.edu.ng	08166273397
2.	Prof. F. M. Dahunsi	Professor	Artificial Intelligence and Wireless Communication	fmdahunsi@futa.edu.ng	08101564160
3.	**P**rof. W. O. Apena	Professor	Computer Architecture and Data Communication	woapena@futa.edu.ng	09028314890
4.	Dr. C. S. Odeyemi	Lecturer 1	Software Engineering	csodeyemi@futa.edu.ng	08066439866
5.	Prof. K. F. Akingbade	Professor	Robotics and Control Engineering	kfakingbade@futa.edu.ng	08035667431
6	Prof. A. A. Ponnle	Professor	Signal Processing and Communication	aaponnle@futa.edu.ng	08103217173
7.	Dr. B. C. Ubochi	Senior Lecturer	Microelectronics	bcubochi@futa.edu.ng	08108762988
8.	Dr. Olaide Agbolade	Senior Lecturer	Embedded System and Lecturer	oaagbolade@futa.edu.ng	08060678448
9.	Dr. Ibukun Olajide	Lecturer 1	Data and Optical Communication Eng.	iaadebanjo@futa.edu.ng	08067219367
10	Dr. K. Adedeji	Senior Lecturer	Artificial Intelligence and Communication Eng	kbadedeji@futa.edu.ng	08059187995

9.5.2 DEPARTMENT OF ELETRICAL AND ELETRONICS ENGINEERING (EEE)

PROGRAMMES OFFERED

a) Postgraduate Diploma (PGD)
b) Master of Engineering (M.Eng)
c) Doctor of Philosophy (PhD)

AVAILABLE OPTIONS/ SPECIALIZATION

i) Power Systems Engineering
ii) Communication Engineering
iii) Control Engineering

PHILOSOPHY & OBJECTIVES OF PROGRAMME

a. Post-Graduate Diploma

To provide an opportunity for advance professional education and training in Electrical and Electronics Engineering for:

Doctor of Philosophy (PhD) Programmes

Electrical and Electronics Engineering is a discipline that enables man in the 21st Century to maintain a life-style that was the substance of dreams over the ages. Its products have bred a plethora of possibilities that are frequently upgraded and changed at mind boggling rate. No nation aspiring to being part of the comity of nations can therefore do so without a virile capacity to use, update and develop most aspects of these disciplines. The postgraduate programmes are aimed at achieving these objectives.

1. The master of engineering programme is designed to address these very issues. It is designed to transform graduate engineers into specialists capable of coping with the extent challenges posed by the complex technological and management issues inherent in the development, operations and sustenance of the industrial, and government and private sectors of a developing economy.

2. The programme is structured to upgrade the theoretical capability that will enable participants to become experts and hopefully remain current in their capabilities in spite of the rapidly evolving nature of the areas concerned. Naturally products of this programme are well-suited also for the educational sector especially at the tertiary level.

3. The courses are thus organized into a core set entailing the kernel elements of the program, and electives designated as advances in the specific area. The course contents included here are only relevant to

i) Knowledge in the profession without necessarily seeking advanced research-oriented degrees;
ii) Those who wish to make up for the deficiencies in their academic background to satisfy the requirements for the practice of electrical and electronics engineering; and
iii) Those who wish to bridge their academic career from the practical-oriented Higher National Diploma course to the more theoretical research-based Studies in the University.

The programme is designed to enable, amongst other, successful candidates attempt and pass relevant profession professional engineer in Nigeria. Those who complete the course with a minimum of Upper Credit and requisite qualifications as stipulated by Senate can also proceed to higher degrees.

b. Master of Engineering (M.ENG) and

the conditions prevailing at the time of preparation of this programme. The actual content will depend on the circumstances and the advances that are relevant to ensuring that the objectives of programme are met. The PhD programme is a research-centered one, which will depend on the background and prior preparedness of the candidate. Candidates may be required to take as well as audit relevant courses in order to improve their capabilities especially i n other disciplines. The choice of research area will depend on availability of supervisors and other equipment. Research will be conducted in topic that are relevant to the technological development of the country as well as contribute to technical knowledge in the fields of electrical and electronics engineering.

REQUIREMENTS FOR ADMISSION

A. PGD PROGRAMME.

In addition to satisfying the minimum UME requirement for admission to engineering programmes in the university, a candidate may possess any or a combination of the following:

(i) A first degree with at least a 3rd class grade in Electrical and/or Electronics Engineering, and
(ii) HND with at least a Lower Credit pass in Electrical and/or Electronics Engineering from a recognized Institution.

B. M.ENG PROGRAMME.

To be qualified for admission into the M.Eng programme, candidates must satisfy appropriate requirements as stated below. A candidate who has:

(i) Bachelor's degree in Electrical and Electronics Engineering with at least a second class lower division from either FUTA or any other recognized university that runs COREN- accredited electrical and electronics engineering programmes is qualified for entry; and
(ii) Candidates with PGD in electrical and electronics engineering must have at least UPPER CREDIT to make him/her eligible to do the M.Eng. Programme.

C. PhD PROGRAMME.
To be qualified for admission into the PhD programme, candidates must satisfy appropriate requirements as stated below. A candidate who has:
(i) An M.Eng degree in Electrical and Electronics Engineering with a minimum score of 60% from either FUTA or any other recognized university that runs COREN- accredited electrical and electronics engineering programmes; and

(ii) Obtained the qualifications tenable for admission into M.Eng programme in
Electrical and Electronics Engineering Department of SEET, FUTA, is eligible to do the PhD programme.

In addition, all candidates are required to satisfy the general University requirements of having at least credits in English Language, physics, Chemistry, Mathematics and any other required subject at the SSCE/GCEO/Level.

DURATION OF PROGRAMMES
a. PDG
The programme shall be four (4) semesters (24months).

b. M.ENG
The M.Eng programme consisting of course work and research will normally last a minimum period of 18 but not more than 24 months on full time basis.

c. PhD
The PhD programme is a research study lasting for a minimum period of 36-48 months full time or 48-72 months part-time beyond a master's degree.

REQUIREMENTS FOR GRADUATION:
a. PGD
Each diploma student is required to successfully complete in four semesters, a minimum of 60 units of course works and 6 units of an independent project.

b. M.ENG
In order to receive the M.Eng degree, a candidate must successfully:
i) Pass all courses selected from a buffet of course outlined.
ii) Present and pass two seminars based on a 12 credit load supervised thesis;
iii) Submit the required number of copies and Pass the oral examination of the submitted thesis.
Where a student exhibits deficiency (ies) in any area, such a student may be required to register for, and pass the appropriate undergraduate course(s) to make up for the deficiency (ies).

c. PhD
In order to receive the PhD degree, candidate must carry out an independent research work in his specialization under the general supervision of selected senior academic staff in the chosen field of research. The candidate must demonstrate high scholastic ability through the research work. The dissertation emanating from the research should exhibit originality and the result must form distinct contributions to knowledge. In carrying out this main requirement, a candidate must observe the following:
i) A candidate must, in consultation with his / her supervisors, present a comprehensive research proposal and a proposal seminar in the department successfully within the first year of study;
ii) As in (i), a candidate must present a progress report and seminar in the department successfully;

iii) On completion of the research work, the candidate must present an end-of- thesis seminar successfully in the department.

iv) A candidate, after carrying out satisfactorily post seminar review, must submit the required number of copies of thesis for a viva; and pass satisfactorily the examination of the submitted thesis.

A. POSTGRADUATE DIPLOMA CURRICULUM AND ITS COURSE CONTENTS

FIRST SEMESTER, YEAR ONE

Course Code	Course Title	L	T	P	U
EEE 701	Engineering Mathematics	2	1	-	3
EEE 705	Numerical Method	2	1	-	3
EEE 707	Statistical Methods	2	1	-	3
EEE 711	Circuit Theory	2	1	-	3

EEE 713	Elect/Elect Engr. Materials	2	1	-	3
EEE 715	EM Field and Waves	2	1	-	3
EEE 717	Electrical Service Design	2	1	-	3
EEE 781	Laboratory Practical I	-	-	3	1
	Total				22

SECOND SEMESTER, YEAR ONE

Course Code	Course Title	L	T	P	U
EEE 702	Engineering Mathematics	2	1	-	3
EEE 720	Solid State Electronics	2	1	-	3
EEE 722	Electronics Devices and systems	2	1	-	3
EEE 726	Digital Electronics	2	1	-	3
EEE 728	Elect/Elect Measurement and Instrumentation	2	1	-	3
EEE 758	Computer Programming	2	1	-	3
EEE 770	Electrical Power Principles	2	1	-	3
EEE 782	Laboratory Practical II	-	-	3	1
	Total				22

FIRST SEMESTER, YEAR TWO

Course Code	Course Title	L	T	P	U
EEE 703	Reliability Engineering	2	1	-	3
EEE 709	Engineer in the Society	2	1	-	2
EEE 741	Control System Engr. I	2	1	-	3
EEE 771	Power System Engineering	2	1	-	3
EEE 751	Communication Principles	2	1	-	3
EEE 761	Electrical Machine	2	1	-	3
EEE 783	Laboratory Practical III	-	-	3	1
EEE 799	Project I	-	-	9	3
	Total				21

SECOND SEMESTER, YEAR TWO

Course Code	Course Title	L	T	P	U
EEE 704	Technical Report Writing	2	-	-	2
EEE 706	Engineering Law, Management and Entrep.	2	1	-	3
EEE 724	Power Electronics	2	1	-	3
EEE 734	Digital Signal Processing	2	2	-	3
EEE 742	Control System Engineering II	2	1	-	3
	Elective	2	1	-	3
EEE 784	Laboratory Practical IV	-	-	3	1
EEE 799	Project II	-	-	9	3
	Total				21

ELECTIVE

Course Code	Course Title	L	T	P	U
EEE 708	Engineering Economics	2	1	-	3
EEE 729	Micro Computer Hardware and Software	2	1	-	3
EEE 748	Communication Systems	2	1	-	3
EEE 754	Data Communication	2	1	-	3
EEE 756	Microwave Engineering	2	1	-	3
EEE 762	Energy Systems	2	1	-	3
EEE 772	High Voltage and Switch Gear Engineering	2	1	-	3

EEE 701 ENGINEERING MATHEMATICS I (3 UNITS)

Review of Matrix Operation including Inversion, Eigen-values, Eigen-vectors and Canonical Transformation and Application. Three Dimensional Vector representations, vector Calculus, Gradient, Divergence and Curl. Line,

Surface and Volume Integrals, Laplacian Operations. Greens, Stoke's and Divergence Theorems and Applications. Ordinary and Partial Differential Equations, Applications and Physical problems. Complex variables, Numerical Analysis, Special functions and Integral, problem formulation, simple method of solution.

EEE 702 ENGINEERING MATHEMATICS II (3 UNITS)
Complex variables: function, deviation, Lagrange series. Taylor series, Cauchy theorem, Cauchy formula, Cauchy integrals. Analytical functions, Singular points, Residual problems, conformal problems and mapping. Special functions: Gamma, Delta, Beta and Error functions. Fourier Integral, Fourier Transform for solving Partial Differential equations.

EEE 703 RELIABILITY ENGINEERING (3 UNITS)
Reliability concepts. Elementary Reliability Theory. Measures of Reliability (Failure Time Distribution Models. Weibull model), Fault tree analysis (FTA). Failure Mode, Effect and Criticality Analysis. Reliability Growth. Maintainability and Availability.

EEE 704 TECHNICAL REPORT WRITING (2 UNITS)
Principle of communications. Preparation and writing of Technical reports. Oral presentation. Use of visual aids and other communication equipment in Technical and Research presentations.

EEE 705 NUMERICAL METHODS (3 UNITS)
Gaussian Elimination, Gauss-Seidel methods and Newton-Raphson Iteration methods of solving linear equations. Forward and backwards difference tables, Central Difference formula, Finite Difference solution to Partial Differential Equations. Solutions of Ordinary Differential Equations (1st and 2nd order) using Runge-Kutta method.

EEE 706 LAW, MANAGEMENT AND ENTREPRENEURSHIP (3 UNITS)
Principle of Management. Industrial, group and organizational behaviour. Motivation. Industrial Law, Legislation on wages, trademarks and patents, Law of Contract and sales of goods. Liability for Industrial injuries. Industrial Relations, Trade Unions, Employer Associations, wages bargaining and the role of the state. Relevant topics on entrepreneurship designed by the National University Commission for Nigerian Universities. Organizational concepts; Human Resource Management. Financial Management. Production Management. Company Policy Development Strategies. Entrepreneurship. Patents, Inventions. Trademarks and Copyrights.

EEE 707 STATISTICAL METHODS (3 UNITS)
Descriptive statistics: Central tendencies and dispersion. Elementary Probability Theory, Conditional Probability, Bayes Theorem, Probability Distributions and Applications. Elementary Theories of sampling and estimation. Test of hypothesis and significance. Curving fitting, linear and multiple Regression Analysis; Linear Correlation, Analysis of Variance, Time Series Analysis. Statistical Quality Control for mean. Standard Deviation, Range, Number of Defects, etc., Sampling Techniques, Average sampling number, stochastic processes.

EEE 708 ENGINEERING ECONOMICS (3 UNITS)
Break-even Analysis. Time Value Money interest Ratios (P/F, P/A, P/G, etc.) Evaluating Single Alternative (PW, AW, KW, IRR, etc.) decision making among alternatives (PW, AW, FW, IRR, etc.). Equal lives and unequal lives. Depreciation methods.

EEE 709 ENGINEERS IN THE SOCIETY (2 UNITS)
Philosophy of Science, history of Engineering and Technology. Safety in Engineering and Introduction to Risk Analysis. The role of engineers in nation building.

EEE 711 CIRCUIT THEORY (3 UNITS)
Elementary signals. Dynamic circuit behaviour, oscillation. First and Second order systems. Laplace and Fourier Transforms. Time and Frequency Domain solution of circuit equations. Stability. Transfer function concepts. Applications of Network Theorems. Single-phase and three-phase circuits. Two-port Network Analysis, Introduction to Computer-Aided Analysis. Application of Laplace Transform to Transient Analysis of RLC circuits. Non-sinusoidal Periodic Waveform. Non-periodic Signals. Different methods of Network Synthesis including Cauer, Foster, Long Division method, Partial Fraction, etc. conditions for reliability. Synthesis of non-linear resistive circuits. Computer Applications in the analysis and synthesis of linear and Non-linear circuits.

EEE 713 ELECTRICAL AND ELECTRONICS ENGINEERING MATERIALS (3 UNITS)
Review of Atomic Theory. Electronic configuration of Engineering materials. Band-bond theory of Solid Semiconductor devices. Dielectric and Magnetic Materials. Masers and lasers. Superconductivity; magnetic alloys; ferrites. Optics.

EEE 715 ELECTROMAGNETIC FIELD AND WAVES (3 UNITS)
Review of Electromagnetic Laws in Integral forms: Gauss' law, Ampere's and Faraday laws. Electrostatic field due to distribution of charge, Magnetic fields in and

around current carrying conductors, Time Varying Magnetic and Electric Fields. Conduction and displacement currents. Maxwell's Equations. Pointing vector, Energy Propagation, and Boundary Conditions.

EEE 717: ELECTRICAL SERVICES DESIGN (3 Units)
Lighting installation, Basic power installation, Power supply and distribution systems; regulations, IEE, NEC, Nigerian standards, choice of cables and conductors, wire systems and accessories, Outdoor low voltage lines and cables, Protection of low voltage installation, Design of electrical installation - domestic, industrial and commercial. Earthling and testing of electric installation, illumination, proposals and contract document preparation. Use of Software such as Microsoft Visio, AutoCAD etc.

EEE 720 SOLID STATE ELECTRONICS (3 UNITS)
Physic and properties of semiconductors including high field effects carrier injection and semiconductor surface phenomena. Devices technology; bulk; and epitaxial material and impurity control. Metal-semiconductor interface properties, stability and methods of characterization. Controlled and surface-controlled devices.

EEE 722 ELECTRONIC DEVICES AND SYSTEMS (3 UNITS)
Diodes circuits. Analysis of single stage amplifier circuits. Multi-stage amplifiers. Oscillators- power supply circuits. Wave-shaping circuits, integrated circuit (Ics). OP- amp circuits.

EEE 724 POWER ELECTRONICS (3 UNITS)
Controlled rectifiers. Converters. Switching characteristics of diodes, transistors. Analysis of circuits using transistors as switches, Power Control circuits, Characteristics of switching transformers, AC-DC converters. Power semiconductors devices protection. Waveform Synthesis.

EEE 726 DIGITAL ELECTRONICS (3 UNITS)
Review of Boolean algebra and Logic Circuits simplifications. Flip flop. Counter, Register, Memory devices, semiconductor technologies; MSI, LSI, etc. interface, digital converter, e.g. ADC, DAC series/parallel converter, etc. Microprocessors, Digital test and maintenance equipment.

EEE 728 ELECTRICAL AND ELECTRONICS MEASUREMENTS AND INSTRUMENTATION (3 UNITS)
Principle of measurements: measurement accuracy. Terminologies. Signals, Potentiometer, and bridges. Instrument types: voltage, current, power, energy, and resistance measurements. Electronic and Electrical instruments. The Cathode Ray Tube (CRT). Transducers; magnetic effects measurements. Data recording. Spectrum analyzers.

EEE 729 MICROCOMPUTER HARDWARE AND SOFTWARE TECHNIQUES (3 UNITS)
Elements of digital computer design; control unit, programming, bus organization and addressing schemes, microprocessor, system architecture, bus control, instruction execution and addressing modes. Machine codes, assembly language and high level language programming, microprocessor and stale machines. Microprocessors interfacing: input and output technique, interrupt system and direct memory access; interfacing to analogue systems and application to D/A and A/D converters. System development tools: simulators, EPROM programming assemblers and loader. Microprocessor and microcomputer operating system and compilers. Microprocessor applications.

EEE 734 DIGITAL SIGNAL PROCESSING (3 UNITS)
Basic concepts and arrears of applications. Discrete-Time Signal and Systems; linearity, shift-invariance, causality, stability, convolution sum and frequency response. Review of sampling theory and Z-transform digital system realization Finite-Impulse Response (FIR) and Infinite Impulse Response (IIR) Filter Design. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT)

EEE 741 CONTROL SYSTEM ENGINEERING I (3 UNITS)
Open and closed loop system. Modeling of physical systems. Dynamic equation of electrical, mechanical, thermal and fluid flow systems. Transfer function of control system components. System response and classification. Stability. Nyquist, Bode and Root Locus analysis. System specification and introduction to design.

EEE 742 CONTROL SYSTEM ENGINEERING II (3UNITS)
Analogue computers. State Space representation of control systems. Stability of linear and non-linear systems. Linearization of non-linear system describing functions. Sampled data systems, Digital control.

EEE 748 COMMUNICATION SYSTEMS (3 UNITS)
Telephony: Antennas and Wave propagation mode. Radar systems. Satellite Communication systems. Broadcasting systems (analogue and digital). Introduction

to Wireless Communication systems. Regulations. Telecommunication system planning.

EEE 751 COMMUNICATION PRINCIPLE (3 UNITS)
A general communication system including source, transmission channel, and destination. Analogue Modulation systems. AM, FM, PM. Pulse Modulation: RAM, PWM, PPM, and PCM. Introduction to Digital Modulation Technique Bandwidth considerations. Devices and systems for communications.

EEE 754 DATA COMMUNICATION (3 UNITS)
Introduction to data communication systems: digital signals and characters, data signals, baud rate, serial and parallel data transmission. Networks and network topologies. Baseband analysis, modulated carrier signals (ASK, PSK, QPSK, BSK, MSK, GMSK, etc.). Coherent and non-coherent detection of binary signals. Error rate comparison, OSI model and functions of file layers, TCP/IP model and function of layers. Network management; telecommunication network management, international standards.

EEE 756 MICROWAVE ENGINEERING (3 UNITS)
Microwave devices and circuits: variation diode, parametric amplifiers, tunnel diodes, schottky diode. Gunn oscillators. Frequency multiplier and up-converters. Microwave theory and techniques; transmission lines and waveguides, passive microwave devices; resonator, magic tee, TWT, etc.

EEE 758 COMPUTER PROGRAMMING (3 UNITS)
Flow-charting and algorithm formulation. Coding with © Visual Basic). High level language (e.g. C++, Linux, Visual Basic). Application to solution of engineering problems

EEE 761 ELECTRICAL MACHINES (3 UNITS)
Electromechanical Energy Conversion systems. DC machines, transformer. Synchronous and Induction machines. The machine as a generator and as a motor. Analysis of electromagnetic torque.

EEE 762 ENERGY SYSTEMS (3 UNITS)
Global energy assessment. Primary and Secondary energy sources. Renewable and non-renewable energy sources. Energy conversion techniques. Energy conservation. Energy management and auditing. Cost of energy

EEE 770 ELECTRICAL POWER PRINCIPLE (3 UNITS)
Generation: sources of energy (thermal, thermal, hydro, nuclear, solar, wind, etc.) economics of power supply (tariffs load curves. Power factor correlation, etc.) Power generation. Transmission and distribution. Corona. Types of cables, insulators. System protection. Performance charts.

EEE 771 POWER SYSTEMS ENGINEERING (3 UNITS)
Modeling of synchronous machines, transformer, transmission line including bundled conductor lines and untranspeed lines. Network representation of power systems. Voltage and frequency loading dependency. Real power balance and its effect on systems frequency. Reactive power balance and its effect on system voltage. Load flow analysis: the load flow problem. Formulation of static load flow equations. Bus classification. Classification of system variables and generalization of n-bus systems. Load-flow solution using Gauss-Seidel and Newton-Raphson methods. Sample case studies.

EEE 772 HIGH VOLTAGE AND SWITCH GEAR ENGINEERING (3 UNITS)
Methods of generation and measurement of high voltages. Types and test on switchgear. Mechanism of dielectric breakdown in gases, liquids and solid protection against over-voltages. Switchgear construction. Oil switches. Air blast, SF6, Vacuum circuit breakers.

EEE 781 LABORATORY PRACTICAL I (1 UNIT)
Electrical Design and Installation
Electrical Circuit Theory

EEE 782 LABORATORY PRACTICAL II (1 UNIT)
Machines
Communication Principles
Control Engineering Systems

EEE 783 LABORATORY PRACTICAL III (1 UNIT)
Electric Power Principles
Digital Electronics

EEE 784 LABORATORY PRACTICAL IV (1 UNIT)
Data Communication

EEE 799 PROJECT (6 UNITS)
Project title is to be selected from an approved list of suitable topics. The actual work is to be carried out under the supervision of a member of academic staff; the standard of work must demonstrate the ability of the student to undertake independent work at a professional level of competence. Each student is required to give project defence seminar of his/her work.

B. M.ENG CURRICULUM AND ITS COURSE CONTENTS

OPTION A: CONTROL ENGINEERING

1ST SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 811	Engineering Mathematics	2	1	-	3
EEE 821	Advanced Analog and Digital Electronics	2	1	-	3
EEE 833	Digital Signal Processing	2	1	-	3
EEE 841	Classical Control Theory	2	1	-	3
EEE 853	Analog and Digital Communications Systems	2	1	-	3
	Total				15

2ND SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 822	Embedded Systems	2	1	-	3
EEE 826	Data Acquisition Systems & Instrumentation	2	1	-	3
EEE 840	Computer Applications in System Engineering	2	1	-	3
EEE 844	Classical Control System Design	2	1	-	3
EEE 892	Seminar	-	-	-	1
One (1) elective course		2	1	-	2
	Total				6

ELECTIVES

Course Code	Course Title	L	T	P	Unit
EEE 824	Power & Industrial Electronics	2	1	-	3
EEE 840	Computer Applications in System Engineering	2	-	3	3
EEE 842	Linear Multivariable and Optimal Control	2	1	-	3
EEE 828	Biomedical Instrumentation	2	1	-	3
EEE 831	Contemporary Computer Systems	2	1	-	3
EEE 832	Computer Networks: Concepts and Fundamental	2	1	-	3
EEE 834	Wireless Networks and Mobile Systems	2	1	-	3
EEE 845	Robust and Fuzzy Control Systems	2	1	-	3
EEE 846	Nonlinear Control Systems	2	1	-	3
EEE 847	Control Theory & Industry	2	1	-	3
EEE 848	Adaptive Control Systems	2	1	-	3

3RD SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 801	Professional Engineering Management	2	-	-	2
EEE 893	Seminar	-	-	-	1
EEE 899	Master's Thesis research Project				12
	Total				15

OPTION B: COMMUNICATIONS ENGINEERING

1ST SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 811	Engineering Mathematics	2	1	-	3
EEE 821	Advanced Analog and Digital Electronics	2	1	-	3
EEE 833	Digital Signal Processing	2	1	-	3
EEE 841	Classical Control Theory	2	1	-	3
EEE 851	Communications Theory and Systems	2	1	-	3
	Total				**15**

2ND SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 822	Embedded Systems	2	1	-	3
EEE 840	Computer Applications in System Engineering	2	-	3	3
EEE 852	Digital Communication Theory	2	1	-	3
EEE 854	Antenna and Radio Wave propagation	2	1	-	3
EEE 892	Seminar	-	-	-	1
	One (1) elective course	2	1	-	3
	Total				**16**

ELECTIVES

Course Code	Course Title	L	T	P	Unit
EEE 824	Power & Industrial Electronics	2	1	-	3
EEE 826	Data Acquisition Systems & Instrumentation	2	1	-	3
EEE 855	Telephony	2	1	-	3
EEE 856	Frequency Spectrum Management	2	1	-	3
EEE 857	Broadcasting Systems	2	1	-	3
EEE 858	Telecommunication System Architecture & Networks	2	1	-	3

3RD SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 801	Professional Engineering Management	2	-	-	2
EEE 893	Seminar	-	-	-	1
EEE 899	Master's Thesis research Project				12
	Total				15

OPTION C: POWER SYSTEMS ENGINEERING

1ST SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 811	Engineering Mathematics	2	1	-	3
EEE 833	Digital Signal Processing	2	1	-	3
EEE 841	Classical Control Theory	2	1	-	3
EEE 863	Energy Conversion for Electric power Generation	2	1	-	3
EEE 871	Power Systems Engineering I	2	1	-	3
	Total				**15**

2ND SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 824	Power & Industrial Electronics	2	1	-	3
EEE 840	Computer Applications in System Engineering	2	-	3	3
EEE 864	Industrial/Commercial System Engineering II	2	1	-	3
EEE 872	Power System Engineering II	2	1	-	3
EEE 892	Seminar	-	-	-	1
One (1) elective course		2	1	-	3
	Total				**16**

ELECTIVES

Course Code	Course Title	L	T	P	Unit
EEE 861	Electric Machine	2	1	-	3
EEE 862	Generalized Electrical Machines Theory	2	1	-	3
EEE 865	Power Stations	2	1	-	3
EEE 866	Renewable Energy Sources for Power Generation	2	1	-	3
EEE 874	Power System Protection & Control	2	1	-	3
EEE 876	Power Systems Stability	2	1	-	3
EEE 877	Interconnected Power Systems	2	1	-	3
EEE 878	Computer Methods for Power System Engineering	2	1	-	3

3RD SEMESTER

Course Code	Course Title	L	T	P	Unit
EEE 801	Professional Engineering Management	2	-	-	2
EEE 893	Seminar	-	-	-	1
EEE 899	Master's Thesis research Project				12
	Total				15

EEE 811: Engineering Mathematics 3 units
Integral transform methods, Fourier, Laplace and z-transform. Linear Algebra, Numerical methods and *computer* application, statistics.

EEE 821 Advanced Analog and Digital Electronics 3 units
Discrete solid state devices - BJT, FET, UJT, SCR, Triacs; Linear Integrated circuits - op amps, voltage controlled oscillators, PLL, F to V converters. Review of logic circuits, SSI, MSI, LSI, micro-controllers elements of interfacing techniques.

EEE 822 Embedded Systems 3 units
Methodologies and technologies for design of embedded systems. Hardware and software platforms for embedded systems, techniques for *modeling* and specification of system behaviour, software organization, real-time operating system scheduling, real-time operating system scheduling, low-power battery and energy-aware system design, timing synchronization, fault tolerance and debugging and techniques for hardware and software architecture *optimization.*

EEE 824 Power and Industrial Electronics 3 units
Functional circuits and systems. Codes *standard* and symbols for industrial system electronics and related *control* Opto-electronics, industrial timing system, and digital electronics system. Electrical energy sources for industrial loads. Principles *of* thyristor (SCR) devices, dynamic characteristics of DC choppers; Phase Control, full wave circuits with inductive load, commutation *power inverter.* Application of the devices.

EEE 826 Data Acquisition Systems & Instrumentation 3units
Microprocessor development systems, programming using assembly and higher-level languages Implementation of embedded application algorithms Details of a contemporary microprocessor architecture Comparative analysis of advance architecture an< specialty architectures. Laboratory work is required Software development including multiple memo models, device drivers, basic network principle including internet applications.

EEE 828 Biomedical Instrumentation 3 units
Introduction to electrical instrumentation and a review of electronics instrumentation, data conversion techniques, biomedical transducers; conventional EEF and ECG machines, embedded systems for biomedical applications, biomedical expert systems.

EEE 830 Introduction to Data Structures and Algorithms 3 units
Introduces fundamental data structures, algorithms and abstract data types. Main topics include data structures such as arrays, linked lists, stacks, queues, graphs and trees, and algorithms such as those that are used for list manipulation, graph searches, sorting, searching and tree traversals. Implementation of data structures and algorithms in C + +.

EEE 831 Contemporary Computer Systems -3 units
Basic concepts in architecture and micro architecture: Partitioning, Timing, Pipelining, Data Path, state machine, micro sequencer, micro instruction definition and microcode, Microprogramming (horizontal, vertical, two-level, dynamic microprogramming, bit steering). Extension to pipelining and pipelined *control. Effective use* of short pipelines, with some digressions into more *effective* use of long pipelines without blocking the structure of a modern pipeline. Functions at each stage. CAD tools. The x86 ISA, and some implementation issues. Pipelining in the year 2004. Branch Prediction. The Trace Cache. The Block structured ISA. Simultaneous Multithreading. Clustering and its implications. Data Flow; HP'S. Pentium Pro and Pentium 4 implementations. Importance of Compiler technology to Future Micro architectures. RISC, a Retrospective, Cache Coherency. Men *lory* consistency. IEEE Floating Fbint arithmetic, The IEEE Standard Foremost. The IBM Fbwer 5 micro architecture.

EEE 832 Digital Signal Process 3 units
Application program interface and network transport services including User Datagram Protocol and Transmission Control Protocol from the Internet protocol suite. Client-server organization and design of synchronous, asynchronous, and multithreaded client and server applications. Design, implementation, and testing techniques to improve robustness and performance. Design and implementation of servers and clients for standard Internet application protocols.

EEE 833 Digital Signal Processing 3 units
Digital filter design and optimization tools, architectures for digital signal processing circuits; integrated circuit modules for digital signal processing; programmable signal processors; CAD tools and cell libraries for application-specific integrated circuit design; case studies *of speech* and image processing circuits.

EEE 834 Wireless Networks and Mobile Systems 3 units
Multidisciplinary, project oriented design course that considers aspects of wireless and mobile systems. Including wireless networks and link protocols, mobile networking including support for the Internet Protocol suite, mobile middleware and mobile applications.

EEE 840 Computer Applications in Engineering Systems 3 units
A review of computer programming and other microprocessor methodology for systems analysis and synthesis. Incidence and network matrices. Algorithms for formation of network and system matrices. Iterative solution method. Computer-aided-design of engineering systems. Microprocessors and microcontroller in engineering systems planning, operation and maintenance.

EEE 841 Classical Control Theory 3 units
Control structures: open-loop, closed-loop *and* feed forward. Basic compensational techniques. Nyquist stability test, design of controllers using Bode plots and Nichols charts. Frequency response specifications, design of cascade and feedback compensators. Modes, stability and design using root loci. Step response tests and specifications.
Samples data control: Approximate continuous to samples conversion, the effect of sampling rate, zero-order hold, stability. Basic methods for the mathematical modeling of physical systems. Continuity and compatibility relations. Case studies for mechanical and electrical systems.

EEE 842 Linear Multivariable and Optimal Control 3 units
Linear optimal regulator problem - finite-time horizon. Principle of optimality, Hamilton-Jacobi equation, Riccati equation. Steady state solution (LQR), algebraic Riccati equation. Properties: gain and phase margin, sensitivity, nonlinearities. Optimal state estimation (Kalman filter), output feedback control. Multivariable system representations and equivalent systems. Controllability and observability. Poles and zeros of multivariable systems. Pole placement using state and output feedback.

EEE 844 Classical Control Systems Design 3 units
Review of control systems characteristics - steady state errors and transient response values; series and parallel compensation, P+I+D compensation, lag, lead, lead- lag compensator design; Brown's *construction, use of* Bode, Nyquist, Circle and inverse plots. Nicholls charts for design.

EEE 845 Robust and Fuzzy Control Systems 3 units
Analysis of systems where parameters are unknown but within known intervals. Structured and unstructured uncertainty. Signed and system norms, performance specifications. Uncertainty and robustness, small gain theorem. Norm-bounded uncertainty, quadratic stability.

EEE 846 Nonlinear Control Systems 3 units
Characteristics of nonlinear system behavior; linearized models. Phase-plane methods; approximate construction of state trajectories. Describing functions: use in predicting oscillations. Piecewise-Linear systems: point transformation method. Variable-structure Systems: sliding-mode control. Compensation for nonlinearities: feedback linearization, dither. Lyapunov function: methods of construction and use. Absolute stability: circle and Popov criteria, small gain theorem.

EEE 847 Control Theories and Industry 3 units
Sequence control techniques; Industrial control sensors. Stabilization techniques; cement Industrial control applications; Steel Industry and Textile Control Systems; Agro-Allied, Industry application.

EEE 848 Adaptive Control Systems 3 units
System models for self-tuning: deterministic and stochastic. Structure of adaptive control systems. Adaptation methods: direct (implicit) and indirect (explicit). Estimation of parameters: gradient descent, recursive least squares. Controller design by pole assignment.

EEE 850 Signals Processing in Communications 3 units
Basic digital signal processing techniques for estimation and detection of signal in communication and radar systems. Optimization of dynamic range, quantization and state constraints; DFT, convolution, FFT, NTT, Wino grad DFT, systolic array; spectral analysis- windowing, AR, and ARMA; system applications.

EEE 851 Communication Theory and Systems 3 units
Principles and techniques for modern communication systems: Basic concepts of Analog and digital communications systems; representation of band pass waveforms; signal space analysis and optimum receivers in Gaussian noise; comparison of digital modulation methods; synchronization and adaptive equalization; applications to modern communication systems; Analog and digital modulation, Pulse code modulation, time frequency multiplexing; Noise in communications systems.

EEE 852 Digital Communication Theory 3 units
Data Transmission: Theoretical and experimental evaluation of methods of modulation and synchronization for digital transmission over channels that introduces both noise and distortion: spread spectrum communication techniques; Digital filtering techniques; Analysis of signals; Estimating and adaptive processes.

EEE 854 Antennas and Radio Waves Propagation 3 units
Properties of electromagnetic waves of frequency in the 100 GHz range in space, line and wave guide, methods of launching E-M waves. Propagation characteristics of space, effect of ground, ionosphere, troposphere. Effect of radiation path on design of radio system, Concept of antenna radiation patterns, radiation resistance, gain, effective area, reciprocity. Aperture antenna, traveling wave and FI antenna, Analysis, design and evaluation of antennas. Principles of range and direction finding by means of radio echoes. Requirements and limitation of radar. Modulation and microwave components of radar.

EEE 856 Frequency Spectrum Management 3 units
Concepts of spectrum allocation to administration services that utilize the spectrum. Management Organization. The deregulation of the electronic media. Related Mathematical Computations. Coverage Area. Location Coordination. Radio frequency. Interference-Co-channel, Adjacent-Channel. General Management Processes. Frequency Assignment Sharing.

EEE 857 Broadcasting Systems 3 units.
Basic structure of broadcasting systems, types of transmitters, Terrestrial broadcast systems, satellite broadcasting systems, signal conditioning, up-link and down link features, specialized devices and impact of information technology on broadcasting systems.

EEE 858 Telecommunication Systems: Architecture and Networks 3 units
Analysis and design of integrated-service telecommunication networks and multiple-access procedures. Stochastic analysis of priority-based queuing system models. Queuing networks; network protocol architectures; error control; routing, flow and access control. Applications to local-area, packet-radio, satellite and computer communication network

EEE 861 Electric Machines 3units
Energy conversion: electromagnetic, magneto-electric; DC machines; AC machines (single phase, three-phase): synchronous, induction; Transformers.

EEE 862 Generalized Electric Machines Theory 3 units
Electrical machine principles Unified theory of machines and representation Method of machine analysis, steady state performance characteristics of A.C machines. Analysis of lumped circuits. Normal and abnormal transients in machines and power equipment.

EEE 863 Energy Conversion for Power Generation 3 units
Electric energy and power, equivalent circuit for an electro-mechanical power conversion system. Homopolar / heteropolar devices. Design of magnetic circuit. Synchronous and asynchronous interaction. Steady-state, performances of synchronous converters.

EEE 864 Industrial/Commercial Power Systems Design 3 units
An introduction to power system design for commercial building and industrial plants Legal and economic consideration, equipment specification and ratings, design practice, fault calculation, grounding, illumination design, electrical heating. Cooling, lighting protection.

EEE 865 Power Stations 3 units
Conventional energy sources: fossil fuel, hydro; Types of power stations; Basic characteristics of power stations; Factors influencing choice of internal circuit; Characteristic circuit diagrams of different power stations.

EEE 866 Renewable energy Sources 3 units
Mini hydro energy, wind energy, solar energy.

EEE 871 Power Systems Engineering 1 3 units
Basic characteristics of power systems; Load representation in schematic diagrams; Parameters and equivalent circuit of networks elements: power lines, transformers, autotransformers; Load flow studies of

networks: solution of steady state load flow for simple networks; Load balancing; Voltage regulation in power systems; Sources of reactive power: characteristics and applications in power systems; Network design techniques; Economic considerations in network design solutions.

EEE 872 Power systems Engineering II
3 units
Introduction to system stability theory: Types of disturbances/transients and stability of power systems; criteria of stability; measures for improving stability of a system; Introduction to protection and control of power systems: protective relay systems; protection of lines, machines.

EEE 874 Power systems Protection and control
3 units
Protective relay of power systems: step by step current protection of lines; Directional and differential protection of lines; Directional and differential protection; Remote protection; Protective relay of transformers: basic protection, protective reserve; Remote protection, current protection, directional and differential protection; overvoltage protection.

EEE 878 Computer Methods in Power Systems and Machines Design 3 units
A study of computer methods in electric power systems analysis, incidence and network Matrices, iterative solution method, computer-aided design of machines, computers and microprocessors in power systems operations and planning.

EEE 899 Master's Thesis Research Project 12 unit
Independent engineering project demonstrating professional maturity, performed under at least one supervisor, who is a senior academic staff.

C. PhD CURRICULUM AND ITS COURSE CONTENTS

EEE 999 Doctoral Research Project
Presently, candidates may apply for work in the following research areas:
Electronics - specialized instrumentation, Analogue, Digital, Physical;
Communications - Analogue, Digital, Spectrum Management, Modern Cell Phone Communications; Control - Applications to industry. Environment, power systems and national development Issues Power Systems - Management of electric Power Distribution Systems, system Load Flow and Network Stability and
Power Machines - Optimal machine design, specialized machines, industrial drive.

POSTGRADUATE LECTURERS IN THE DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

S/N	NAME OF STAFF	STATUS	QUALIFICATION	AREA OF SPECIALIZATION
1	Dr. M. R. Adu	Associate Professor	B.Eng. (Akure), M.Eng. (Akure), Ph.D (Akure)	Power Systems Engineering
2	Prof. A. O. Melodi	Professor	M.Sc (Ukraine), Ph.D (Moscow)	Power Systems Engineering
3	Prof. S. A. Oyetunji	Professor	B.Eng. (Ilorin), M.Eng (Benin), Ph.D (Benin)	Communications Engineering
4	Prof. J. J. Popoola	Professor	B.Eng. (Akure), M.Eng. (Akure), Ph.D (Johannesburg)	Communications Engineering
5	Prof. A. A. Ponnle	Professor	B.Eng. (Akure), M.Eng (Akure), Ph.D (Sendai, Japan)	Communications Engineering
6	Prof. T. O. Ale	Professor	OND (Owo), B.Eng. (Akure), M.Eng. Akure), Ph.D (Akure)	Power Systems Engineering
7	Dr. M. O. Oyeleye	Associate Professor	HND (Ibadan), PGD (Akure), M.Eng.(Akure), Ph.D (Akure)	Power Systems Engineering
8	Dr. B. C. Ubochi	Senior Lecturer	B.Eng. (Owerri), M.Sc (Manchester), Ph.D (Swansea)	Electronics Engineering
9	Dr. K. B. Adedeji	Senior Lecturer	B.Eng. (Akure), M.Eng (Akure), M.Tech (Pretoria), Ph.D (Pretoria)	Communications Engineering
10	Dr. O. A. Agbolade	Senior Lecturer	B.Eng. (Ogbomoso), M.Eng.(Akure), PhD (Akure)	Communications Engineering
11	Dr. (Mrs) I. A. Olajide	Lecturer 1	B.Eng. (Akure), M.Eng. (Akure), Ph.D (Akure)	Communications Engineering
12	Dr. A. O. Owojori	Lecturer 1	B.Eng. (Akure), M.Eng. (Akure), Ph.D (Akure)	Control Systems Engineering

9.6 SCHOOL OF ENVIRONMENTAL TECHNOLOGY (SET)

9.6.1. DEPARTMENT OF ARCHITECTURE (ARC)

M. TECH

Master of Technology in Architecture

Master of technology (M. Tech) Architecture, as an interdisciplinary field embraces science Technology and the Humanities in the solution of environmental design problems. Because designers perform critical roles in improving the quality of the built environment, the process of their education must recognize and be sensitive to human needs and aspiration as well as to the wise use and conservation of resources. The programme at the Federal University of Technology, Akure recognizes these and attempts to provide the student with a sound grasp of the technological choices suitable and critical to national development

AIM AND OBJECTIVES

The aim and objectives of the Postgraduate in Architecture are rooted in those offered at the undergraduate level but given more emphasis at this higher level. These aim and objectives are summarized as follow:

- To produce competent, skilled and creative professionals who are capable of meeting the challenges of creating comfortable human environments.
- To explore the rich cultural, traditional or local resources of the country including the traditional technology and adapting them to modern effective use.
- To provide an educational process that recognizes, and is sensitive to, human needs and wise use and conservation of resources.
- To provide a comprehensive education such that the graduate is able to plan, design, build, commission, maintain and coordinate the allied professional inputs in the development of the human environment and
- To provide an educational structure that is flexible and able to meet the needs ofArchitectural education.

ADMISSION REQUIREMENTS

Candidates must satisfy the general regulation governing postgraduate admissions in Federal University of Technology,Akure

A good B.Tech Architecture degree of the Federal University of Technology, Akure or a good first degree of a recognized University in Architecture with at least a Second Class Honor's Lower degree.

In addition to above, a candidate other than the graduate of FUTA must produce evidence of industrial Training totaling a period of six months.

DEGREE REQUIREMENTS

In addition to the course work, the award of M. Tech degree is subject to the successful completion of an Architecture Design Thesis or a dissertation. The duration of the programme is three semesters. The graduate of this programme is for the stage II registration of the Architecture Registration Council of Nigeria (ARCON).

REQUIREMENT FOR GRADUATION

A minimum total of 200 credit units is required for the completion of the course programme in B. Tech. (Arch) and 54 credit units required for the completion of the M. Tech (Arch) making a total of 524 credit units in all.

COURSE STRUCTURE

M.Tech

First Semester

Course Code	Course Title	L	T	P	U
ARC 801	Advanced Architectural Design (Life Project)	1	0	15	6
ARC 803	Specification Writing	2	1	0	3
ARC 805	Research Methodology	2	0	0	2
ARC 807	Professional Practice & Procedure I	2	1	0	3
ARC 809	Advanced Urban Design	2	0	0	2
ARC 811	Environmental Impact Assessment	2	1	0	3
ARC 813	Construction Management I	1	1	0	2
	TOTAL				**21**

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
ARC 804	Arbitraton & Awards	2	1	0	3
ARC 806	Design Economics & Cost Planning	2	1	0	3
ARC 808	Professional Practice & Procedure II	2	1	0	3
ARC 810	Applied Climatology	2	1	0	3
ARC 899A	Advanced Design Studio: Thesis I	2	0	0	8
	TOTAL				**20**

Third Semester

Course Code	Course Title	L	T	P	U
ARC 815	Design Seminar Advanced Design Studio : Thesis II	2	1	3	4
ARC 817	Current Issues in Practice Design Seminar	2	1	3	4
ARC899B	Advanced Design Studio : Thesis II Current Issues in Practice	0	0	0	8
	TOTAL				**16**

COURSE DESCRIPTION

ARC 801 Advanced Architectural Design (Life Project) 6 Units

The semester will be specifically focused on Life projects. Students are expected to undertake life projects of the University or where possible within the immediate locality. The department liaises with the appropriate authorities and gives the students at least three (3) design options out of which a student will be expected to work on one. Project implementation will not be subject to studio. However, students can consult with their studio adviser(s) on the topic chosen. All design parameters including cost and the structure of the building are expected to be taken into consideration.

ARC 899A: Advanced Design Studio Thesis 8 Units

The semester will concentrate on the choice of thesis Topic, identification of scope, data collection, and case studies and so on. Students are expected to defend their chosen topics before a panel of jurors.

ARC 899B: Advanced Design Studio Thesis 8 Units

The semester is mainly for Thesis Design and written report on Thesis. It involves collation and analysis of data collected, with the first departmental jury to assess data collected and analyzed by the students. The second department jury will assess design analysis and critical evaluation of the project with the aim of assisting the student. The final departmental **jury to screen candidates for the external examination** will focus on all drawing produced for presentation. The jury will assess design developments including presentation and work drawings, details drawings, presentation(s) and /or model. Also written Thesis must be concluded and dispatched to the external examiners before his arrival to examine the students in the department.

ARC 803: Specification Writing **3 Units** Principles and methods involved in the compilation of a specification for building works, objectives and purpose of a specification. The specification as a contract document, legal tender and working aspects. Relationship to Bills of Quantities and drawings. Schedules, sources information, references. Outright and performance specifications, prime cost and provisional sums. Specification section, clauses and language. Master specifications, preparation, format, building and printing. Explanation of documents and general conditions.

ARC 804: Arbitration and Award 3 Units

General conditions of liability in Torts. Capacities of parties. Trespass to goods, person and property, fraud, negligence, nuisance and strict liability offences. Dangerous chattels land and structures. The nature and function of arbitration in relation to building contract disputes. The parties to arbitration. The arbitrator, his duties and powers. Discussion on a few case-studies.

ARC 805: Research Methodology 2 Units

Formulation and tests of hypothesis. Identification of dependent and independent variables, parameters etc. Sampling techniques, constraints and bias. Design of questionnaire instrument in the conduct on interviews. Data collection, handling and analysis. Limits of research activities. Application of research techniques to workshop and field situations. Introduction to computer hardware. Simple examples of data processing, numerical methods and statistical analysis. Practical exercise for illustration of basic concepts and uses of computers are essential.

ARC 806: Design Economics and Cost Planning 3Units

Principles of building economics. Determinants of building costs and their precision. Discussions on uncertainty and investment economics. System and techniques of creative cost-control for buildings during schematic design, design development, construction document preparation and construction.

ARC 807: Professional Practice and Procedure 1 3 Units

An overview of the practice of architecture. Topics include professional organization and conduct, the architects services business law or company law, office organization and management, contract documents, building codes, aspect of contract management and cost control, accounting and site supervision. Guest speakers are invited.

ARC 808: Professional Practice And Procedure 2 Units

The building process. The process of Architecture and the Nigerian Institute of Architects. ARCON and the Degree No.1 of 1969. NIA conditions of engagement and codes of professional conduct. Brief development of NIA work stages, Building Control Messages.

ARC 809: Advanced Urban Design 2 Units

Concepts guiding the design of cities. Stockade city, market city and industrial city. Factors influencing the development and growth of new towns. Basic concepts guiding the design of component of cities, residential neighborhood, civic, spaces, recreational spaces, central business district, shopping centers, industrial areas and so on. The vocabulary or urban design elements urban space, scale in urban design, image of a city. Urban heritage analysis of world famous cities in urban spaces. The form, structure and dynamics of cities in developing cities in general and Nigeria is particular.

ARC 810: Applied Climatology 3 Units

This course introduces postgraduate students of architecture to the application of building climatology in architectural design. The maintenance of thermal comfort by the human body in different climatic conditions is used to determine the design of sun shading devices and choice of building materials and elements. The design of building for effective natural ventilation is introduced. Other topics covered include climatic site analysis, practical use of the Mahoney tables, recommendations for architectural design in the climatic design zones of Nigeria, control of tropical microclimates through landscape design, design of solar buildings, sustainable architecture, green architecture and green building rating systems. Each topic is covered within a two-hour lecture, but two smaller topics may be combined to form one lesson. Emphasis is placed on the achievement of environmental control through the building fabric and design, especially by using design aids such as Mahoney tables and climatic site analysis. The goal is sustainable (green) architecture, viz. the design, construction, occupation and maintenance of buildings premised on processes and technologies that are environmentally responsible and resource efficient throughout the buildings life cycle.

ARC 811: Environmental Impact Assessment 3 Units

Lectures and seminars are designed to familiarize students with systems of impact evaluation and develop their ability in value judgment. Examination of the policies and procedures for environmental impact and each student is expected to prepare an environment impact statement relative to a proposed development. Environmental positivism and Determinism, Definition, significance and scope of ecology. Examination of the analysis for environmental impact assessment studies. Environmental qualities standards, pollution control. Environmental protection feasibility studies. Environmental conservation as an aspect of environmental protection.

ARC 813: Construction Management 3 Units

Production Planning and Control-Bar Chart, Critical Part Method (CPM), Performance Evaluation and Review Techniques (PERT), Line of Balance etc. Coordination, control and supervision of project. Sites-site layout, site management practices, reporting to management etc. Building Management procedure from inception to completion. Work study and productivity studies-method study, time study and activity sampling, incentives etc. Working capital and flow and fund – Budgetary control, cash flow, financial ratios and statement for the construction industry, personnel administration in the construction industry.

ARC 815: Design Seminar 4 Units

One of the requirements for this semester is the presentation of a design paper by the student. The subject of the paper must however be from an area of the students approved Thesis topic. The paper is expected to examine issues of considerable importance to design Thesis. The seminar paper is aimed at introducing the student to the act of academic paper writing and presentation.

ARC 817: Current Issuses in Practice 4 Units

Further studies on professional practice and procedures to acquaint students with current issues and modern techniques in the practice ofArchitecture.

Masters of Landscape Architecture (M.L.Arch)

The 12-month Masters programme in landscape Architecture is directed towards the analysis, planning and design of exterior urban and rural state within the context of the context and climate of Nigeria in West Africa sub region. The programme is designed to accommodate both group and independent investigation of specific aspects of landscape architecture and to provide adequate background in professional management of aspects of landscape architecture. Each student will select and develop a thesis on contemporary rural and urban environment problems from the micro to regional scale and under the close supervision of an advisor or group of advisors.

ADMISSION REQUIREMENTS

Candidates for the Master's degree in LandscapeArchitecture should hold B.Arch degree of Federal University of Technology, Akure or the M.sc Arch professional degree or equivalent from recognized Universities.

Candidates having professional degres in Urban and Regional Planning, or related disciplines may also apply with details of qualification an evidence of ability to communicate freely in graphics preferably, the presentation of a portfolio of the candidate creative two and three-dimensional work in different media.

COURSE OUTLINE

M.L ARCH.

Course Code	Course Title	L	T	P	U
LARC 821	Landscape Design and Construction	1	0	15	6
LARC 823	Plants and Planting Methods	2	1	0	3
LARC 825	Landscape Conservation and Rehabilitation	2	1	0	3
LARC 827	Terrain Analysis	1	1	3	3
	TOTAL				**15**

SECOND SEMESTER

Course Code	Course title	L	T	P	U
LARC 899	Landscape Design Thesis	0	0	18	6
LARC 824	Public Recreation Planning	2	0	0	2
LARC 826	Landscape Specification and Estimate	1	1	3	3
LARC 828	Environmental Input Studies	2	0	0	2
LARC 830	Professional Practice	2	0	0	2
	TOTAL				**15**

COURSE DESCRIPTION

LARC 821 :Landscape Design and Construction 1-0-15 6 Units

A series of design and construction assignment to be executed in the studio. Design and construction as an integrated process. Materials properties and construction techniques. Simple to complex landscape exercise, applying the materials and techniques of construction techniques and basic specification courses with an emphasis on user requirements.

LARC 822: Landscape Design Thesis 0-0-18 6 Units

A specialized individual study under staff supervision which enables the student to gain knowledge in some aspects of landscapes architecture not yet covered or to extend its knowledge in one ready cover. The study does not necessarily require original experimental research for the purpose of discovering new facts or the testing of an hypothesis. It is neither an essay promoting the students unsupported opinion.

LARC 823: Plant and Planning Method 2-1-0 3 Units

The exotic and native plants in general use within the climatic zones in southern Nigeria. Availability uses and limitations methods of propagation, planting, fertilizing and after care. Commercial forestry, native and exotic grasses and shrubs, turf culture. Plant pest and diseases and their control by chemical and other means. A number of visits will be arranged to commercial plant and nurseries.

LARC 824: Public Recreation Planning 2-0-0 2 Units

Open space capable of use for public recreation is studied as a diminishing natural resource but increasing demand. Open space classification-natural parks, historic sites, reserves etc. are examined and achievement previewed. Overseas example of planted recreational use is studied in details.

LARC 825 Landscape Conversation and Rehabilitation 2-1-33 Units

Conservation is studied as the rotational use of the environment to achieve the highest sustainable quality of living. Principles of conservation and rehabilitation are examined and a number of specific examples studied. Landscape threatened or adversely affected by increasing misuse through mineral extraction, industrial waste disposal and blight are examined and studied. The studies may include methods of control and rehabilitation.

Larc 826: Landscape Specification And Estimates1-1-3 3 units

Principle and methods of landscape specification and an estimate. Outright and performance specification together with section, causes are terms appropriate to each type. Units rates for landscape operation-excavation, haulage, filling, top-soiling, grassing, paving etc. Cost of labour materials and overheads.

LARC 827: Taerring Anlysis 1-1-3 3 Units

An introduction to remote-sensing technique for landscape analysis including land form, vegetable, and land-use interpretation.

LARC 828: Environmental Impact Analysis 2-0-0 2 Units

Lectures are seminars designed to familiarize students the system of impact evaluation and develop the ability in value judgment. The series in include exercises in the use of matrix and examines both the policy and procedures for environmental impact study. A number of real cases are studied on each students is required to prepare an environmental impact statement relative to processed

development. The relationship between landscape architect, plant and the contractors and the legal responsibility of each code of ethnics, and scale of charges. Offices procedures, documentation and job organization.

LARC 830: Professional Practice & Procedure (ARC807 & ARC808 Renewed For Landscape Piaches)

M. PHIL (MASTER OF PHILOSOPHY)

The Master of Philosophy (M.Phil.) Architecture degree is a post-professional degree of a 24month duration, which offers research as the central component of the curriculum. The M.Phil. programme consist of a series of seminar-based and research oriented courses for both theoretical and practical issues. There is also the opportunity for specialized research in any of the areas of major concentration especially studies in the emerging trends in the practice of architecture. This will take the form of a comprehensive developed researched thesis done under the close supervision of an advisor or group of advisors. The product of this programme will be ready and suitable for employment in the academic and the architecture concerns in the public and private sectors.

PROGRAMME OBJECTIVES

The main goal of the programme is to train academics and researches in Architecture to acquire relevant skills. The objectives are specifically to;

- Expose candidates to the current research methodologies in the chase area of specialization:
- Enable candidates to identify problems in Architecture and proffer solutions to them; and
- Develop in candidates the mastery of appropriate conceptual and procedural skills to articulate a critical analysis of advanced study inArchitecture.

JUSTIFICATION FOR THE PROGRAMME

The M. Phil. Programme is designed to meet the research needs of the students with the professional Master of Technology (M. Tech) degree in Architecture or its equivalent. It is intended to faster the development of independent research skills to enhance their ability to proceed to the Doctor of Philosophy (Ph.D.)

ADMISSION REQUIREMENTS

(I) Candidates should hold the professional M. Tech (Arch) or B. Arch degree of the Federal University of Technology,Akur e or other recognized Universities with a minimum Cumulative Grade Point Average (CGPA) of 3.0 on a 5-point credit scale and a minimum thesis score of 50%.

(ii) Candidates with M.Sc. (Arch) professional degree or equivalent of other recognized Universities with 55.59% overall score.

(iii) M. Phil candidates must have scored a minimum **of** 50% or 2.4 at the Professional Masters Degree programme.

(iv) M. Phil/Ph.D: candidate shall have scored 60% and above or CGPA of 3.5 and above at the Professional Masters Degree Programme.

(v) All application for admission shall be subject to Postgraduate Schools regulations and carrying capacities.

DURATION OF PROGRAMME

a. M.Phil Programme

The Master of Philosophy Programme shall be a Full-Time programme of twelve (12) to eighteen (18) months duration.

b. M.Phil/Ph.D Programme

The duration for M. Phil/Ph.D. programme shall be minimum of twelve (12) to maximum of eighteen (18) months and candidates who fail to meet the minimum requirement for conversion to Ph. D shall terminate the programme at the M. Phil level. The final oral examination shall follow the same procedure as for the M. Phil oral examination.

Furthermore, the M.Phil and M.Phil/Ph.D programme shall be on Full-Time basis.

REQUIREMENTS FOR GRADUATION

To be eligible for the award of the Master of Philosophy degree in Architecture (M.Phil. Arch) candidate must:

a. M.Phil Programme

For an M.Phil candidate and those who could not successfully convert to the Ph.D programme, the graduation requirement shall be as follows:

i. The candidate must have passed a total number of 21 Course Units including 6 Units of Independent Research Thesis and 3 units of Research Methods and attain at least a pass mark of 50% in every course offered.

ii. Present successfully one seminar paper in each of the following three courses: ARC 831, ARC 832, ARC 833 and pass all other prescribed exercises in the courses.

iii. To proceed to Ph.D, the candidate must score an average of 60% or a minimum of 3.50 and above on a 5 point grading system.

iv. If the candidate cannot proceed to Ph.D, the candidate will be awarded the terminal degree of M.Phil by successfully:

(a) passing all the courses recommended by the Department with a minimum score of 50% in each course including make-up courses.

(b) presenting at least 2 Seminars (Proposal and Progress Seminars), on a topic approved by the School of Postgraduate Advisory Committee in a specialized area (ARC 899).

(c) completing the thesis title registration according to the School of Postgraduate Studies regulations.

(d) defending the research thesis of about 20,000 words in length, excluding appendices and bibliography, which shall be assessed at an oral examination organized by the School of Postgraduate studies. Academic members of staff shall supervise the thesis project, which will normally span two semesters.

(e) fulfilling other conditions as prescribed by the School of Postgraduate Studies.

b. M.Phil/Ph.D Programme

i. Candidate is expected to pass a total number of eleven (11) Course Units, which shall include 3 units of Research Methods and attain at least a pass mark of 50% in every course offered. The candidate shall also sit for one comprehensive examination, which shall be a written examination to test the knowledge of the candidate in the course work and oral examination on the research proposal before a panel of examiners. The course work examination shall be graded as 60% and the research proposal (project) to be presented shall be graded as 40%. To proceed, the candidate must score an average of 60% or 3.50 on a 5 point grading system and above.

ii. Present successfully one seminar paper in each of the following three courses: ARC 831, ARC 832, ARC 833 and pass all other prescribed exercises in the courses.

iii. If the candidate cannot proceed to Ph.D, the candidate will be awarded the terminal degree of M.Phil by successfully:

(a) passing all the courses recommended by the Department as approved by Senate with a minimum score of 50% in each course including make-up courses.

(b) presenting at least 2 Seminars (Proposal and Progress Seminars), on a topic approved by the School of Postgraduate Advisory Committee in a specialized area (ARC 899)

(c) completing the thesis title registration according to the School of Postgraduate Studies regulations.

(d) defending the research thesis of about 20,000 words in length, excluding appendices and bibliography, which shall be assessed at an oral examination organized by the School of Postgraduate studies. Academic members of staff shall supervise the thesis project, which will normally span two semesters.

(e) fulfilling other conditions as prescribed by the School of Postgraduate Studies.

Note: For Non-FUTA graduates, appropriate translation of Transcripts will be carried out by the Department and Postgraduate School.

REQUIREMENTS FOR CONVERSION FROM M. Phil, M. Phil/PhD TO Ph.D. PROGRAMME

Requirements for conversion from M. Phil, M.Phil/Ph.D to Ph.D: A candidate who enters an M. Phil, M.Phil/Ph.D programme may convert to Ph.D programme if he/she fulfils the following requirements:

i. Candidate must have successfully presented at least two seminars: proposal and progress seminars.

ii. Prepares and submits to the Postgraduate School through the Department, a research plan considered suitable for pursuing a Ph.D. Degree;

iii. Candidate must have presented a detailed report of research-work done up to the time of seeking conversion and submitted to the School of Postgraduate Studies any relevant published and unpublished materials that can be assessed by the Department.

iv. Candidate must have completed all course work with CGPA of not less than 3.5 or 60% aggregate score in the M. Phil, M.Phil/Ph.D programme.

v. Passes an oral transfer examination to be conducted by the panel drawn from his/her department on the subject of the research and related topics to the field of study.

vi. Candidate must have fulfilled all other conditions as approved by the University Senate.

vii. Candidate must obtain and complete Ph.D Conversion Form as appropriate.

Note: for candidates from other Institutions, Departments and Postgraduate School shall interpret transcript carefully before admission

COURSE STRUCTURE

M.PHIL .

First Semester

Course Code	Course Title	L	T	P	U
ARC 831	Nature and Philosophy of Architecture	1	0	3	2
ARC 833	Research Methods and Statistics	1	0	6	3
Electives					
ARC 835	Advanced Urban Design Workshop	1	0	3	2
ARC 837	Architectural Criticism Seminar	1	0	3	2

ARC 839	Computer Aided Design Seminar I	1	0	3	2
ARC 841	Environmental Studies Seminar I	1	0	3	2
ARC 843	Housing Theory and Seminar I	1	0	3	2
ARC 845	Landscape Theory and Design Seminar I	1	0	3	2
M.Phil: 2 Compulsory & 2 Elective Courses					**9**
M.Phil/Ph.D: 2 Compulsory & 1 Elective Course(s)					**7**

M.PHIL Second Semester

Course Code	Course Title	L	T	P	U
ARC 832	Design and Environmental Process	1	0	3	2
Electives					
ARC 836	Advanced Urban Design Workshop II	1	0	3	2
ARC 838	Architectural Criticism Seminar II	1	0	3	2
ARC 840	Computer Aided Design Seminar II	1	0	3	2
ARC 842	Environmental Studies Seminar II	1	0	3	2
ARC 844	Housing Theory and Seminar II	1	0	3	2
ARC 846	Landscape Theory and Seminar II	1	0	3	2
ARC 899	Independent Research Thesis	0	0	18	6
M.Phil: 1 Compulsory 2 Elective Courses					**12**
M.Phil/Ph.D: 1 Compulsory 1 Elective Course(s)					**10**

COURSE SYPNOPSES

ARC 831: Nature And Philosophy of Architecture 2units

Analysis of architecture/building science research with the framework of policies, directions, methods, priorities, resources, peculiarities and inter-dependence. The study deals with selected projects, case studies and research undertaking in the field of architecture, building sciences and interrelated areas. The course also seek to cultivate creative insights and creative insight in judgment in the studies by examining in seminars the following: signs and symbols, special concepts, expression and communication, ethics and aesthetics, morality and education etc.

ARC 832 :Design and Environmental Processes 2 Units

Analysis activities, ideas and resources for the future of architectural practice and building construction. Effects of urbanization, globalization and modernization on architecture, building construction and the build environment in Nigeria. Current issues on new products, methods and theories. Presentation by eminent scholars in architectural practice and other relevant professionals in the build environment. Assigned readings and seminars on topical issues in design and environmental processes.

ARC 833: Research Methods And Statistics 3 Units

Different approaches and tools for investigation. Application of least square regression theories to the analysis of variance and regression analysis, measurement and surveys, reliability and accuracy tests, special parametric, univariate and multi-variate distributions, no parametric and sequential method of qualitative data, quantitative and qualitative methods of analysis. Further theory of statistical inference.

ARC 835: Advanced Design Urban Workshop1 2 Units

Urban design and the planning process. Nature and elements of urban design and as means of promoting beauty in the urban environment. Approaches to the analysis of cities, historical, theoretical, philosophical and practical. The recent concern of Urban Design-theories, pioneers and their ideas. Review of contemporary urban design inn ovations-garden city and green belt: super block; Centre's and industrial parks. Reading assignments and seminars are to be presented by candidates.

ARC 836: Advanced Design Urban Workshop 2 Units

Approach to City –Planning in Nigeria, Problems of urban design in Nigeria. Urbanization in developing countries in scale and pace.A review of major changes in Urban population in the last 100years. The impact of urbanization on housing and the urban environment. The link between urbanization processes, globalization, human shelter and environment. The quality of the general urban environment and human consequences of urbanization in developing countries. Reading assignments and seminars are to be presented by candidates.

ARC 837: Architectural Criticism Seminar 2 units

Architectural criticism reveals the methods and techniques of the analysis and presentations of world known critics. It reveals the varieties of ways and means critics use in responding to architectural environment. It is directed to attempt to influence current decisions to affect more tolerable future by presentation of the seminar on the understanding of criticism, methods of criticism and the rhetoric of criticism.

ARC 838: Architectural Criticism Seminar 2units

The relationship between history, theory and criticism in architecture. Sources of architectural theory. The social ecology of architecture and its effects on architectural practices, theory, construction and criticism. The nature of criticism in architecture, it rolls and concerns. Types and context of criticism. Analysis of selected case-studies and seminar presentation.

ARC 839: Computer Aided Design Seminar 2units

Lectures and assignments in one or more of the following areas; introduction to design computing, architectural construction and computation, digital design fabrication, computational design, background shape grammars, special problems in shape grammars, geometric and programmed construct. Assessment is based on attendance, assignments, workshop and presentation of a research seminar in computation. The research seminar is presented publicly.

ARC 840: Computer Aided Design Seminar 2units.

Study of advanced projects in digital media, inquiry into computation and design, research seminar in computation and workshop in architectural computation. Current and required areas may be added as necessary. Assessment is based on attendance, assignments, workshop and presentation of a research seminar in computation.

ARC 841: Environmental Study Seminar 1 2units

Lectures and assignments in one or more of the following; green architecture, sustainable architectural, climate change and architectural design, environmental impact design, environmental impact assessment, passive solar architectural design, daylight and lighting design, micro climate analysis. Assessment is based on attendance, assignment and presentation of a two-stage seminar including case-study presentation in a selected area. In the first stage, the seminar is presented internally to the class members. In the second stage, the seminar reflects comments and corrections from the first stage and is presented publication.

ARC 842: Environmental Study Seminar 2Units

Lectures and assignments in the following areas; noise and auditorium acoustics, physiology and psychology of comfort theory, ventilation and air conditioning, service strategies, building performance analysis, energy and her flow calculation for architectural design, computer application in environmental studies, specialist topics and case study presentations. Current and required areas may be added as necessary. Assessment is based on attendance, assignments and presentation of a research seminar in computation.

ARC 843:Housing Theory And Seminar 1 2units

Housing policy and development issues. Third world housing processes and housing policies. And examination of policies and practices, in Africa and South East Asia. Lessons from the World Bank and other international agencies. Formulation and assessing housing policies at local and national levels. Methods of housing supply, sources, subsidies, rental control and finance. Land tenure system and the impact on housing policies, programme and institutional framework. The building industry, technology, materials and labour. Establishing target groups and planning for them. Analysis of selected case studies and seminar presentations.

ARC 844: Housing Thoery And Seminar Ii 2 Units

The history of public policy in Nigeria. Sustainable housing policies and settlement problems in poverty areas. Design of component and systems for self-help; design and planning for self-sufficiency, low cost energy and servicing systems. Low cost energy and servicing systems. Government policies and the housing of squatters. Case study examination of squatters including the legal and administrative mechanism for development will be presented in a seminar session.

ARC 845: Landscape Theory and Design Seminar 1 2units

The course explores the knowledge of landscape architecture, juxtaposing both the built box and writings of landscape architects with texts that address methodology or theoretical and cultural contexts. It also examines the challenges to the profession from the point of view of ecology and arts. Principles and method of landscape specifications and estimates together with sections, clauses and terms appropriate to each type. Study of the availability, uses and limitations, propagations and planning, fertilizing and maintenance of exotic and native plants in southern Nigerian assessment is based on attendance and seminar presentation.

ARC 846: Landscape Theory And Design Seminar 2 Units

Open space capable of use for public recreation is studied as a diminishing landscape resource but in increasing demand. Open space classification and world examples are examined and implication reviewed. Sustainable landscape architecture. Examination of the principle conservation, method of control, rehabilitation and the study of specific examples as the rational use of the environment to achieve sustainable quality of living. The role of landscaping in urbanization process. Assessment is based on attendance and seminar presentation.

ARC 899: Independent Research Thesis6 Units

This is an in-debt and original research work on area of architecture that is of interest to the student. The thesis on a

researchable problem chosen by the candidate and approved by the candidate must be carried out under the guidance of a supervisor or group of supervisors. The student defends the thesis at the end of the course before a panel of examiner(s) in line with the school of post graduate studies procedure. The research thesis must make substantial s to knowledge.

Ph. D ARC

ARC 999: Doctoral Project

The research which commences upon admission into doctoral candidacy status is an original investigation designed, conducted, analyzed and reported under the direction of a major supervisor and one or more co- supervisors. The doctorate candidate must be responsible for the design, analyses and conduct of the study which represents his/her individual intellectual and creative contribution to the subject area in question and to the discipline of architecture. Each candidate is required to prepare a thesis, which represents the report of the study, in an effectively organized and well written form. The candidate is expected to present at least three seminar papers before the final oral presentation. The thesis is examined in a Viva voce.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF ARCHITECTURE

S/N	Names	Rank	Phone Numbers	Area Of Specialization
1.	Prof. Hezekiah Adedayo Ayoola	Professor	08033799014	Housing and Human Settlements Studies, Urban Poverty Studies, Behavioural Architecture, Urban Studies
2.	Prof. Olatunde Arayela	Professor	08066505522	Development Of Local Building Materials For Low-Cost Housing Schemes
3	Prof. Olusimibo Oladimeji Ogunsote	Professor	08034735611	Architectural Science, Computer Application In Architecture
4	Prof. Abraham Adeniyi Taiwo	Professor	08035888286	Urban Housing, Urban Design
5	Prof. Yomi Michael Daisiowa Adedeji	Professor	08064681423	Architectural Science, Building Materials
6	Prof. Gabriel Fadairo	Professor	08033560305	Banking Design, Urban Design Studies With Particular Focus On Urban Erosion, Flood Management Studies
7	Prof. Dorcas Aina Ayeni	Professor	08037006788	Landscape Architecture, Architectural Tourism, Urban Design Studies
8	Prof. Olaniyi Olanipekun Aluko	Professor	08035815663	Architectural Science, Building Materials
9	Prof. Joseph Adeniran Adedeji	Professor	07031117205	Landscape Architecture, Urban Design
10	Prof. Alexander Adeyemi Fakere	Professor	08035019352	Housing Settlement Studies, Urban Design
11	Dr. Victor Olufemi Adegbehingbe	Snr. Lecturer	08033605933	Housing Settlement Studies, Urban Design
12	Dr. Olumuyiwa Bayode Adegun	Reader	09099664705	Sustainable Human Settlements (Green Infrastructure), Housing Studies
13	Dr. Reuben Peters Omale	Reader	08033514401	Urban Aesthetics, Environment and Behaviour Studies
14	Dr. Morisade Omorinola Adegbie	Snr. Lecturer	08066245730	Architectural Science
15	Dr. Adewale James Afolami	Snr. Lecturer	08033744936	Architectural Science
16	Dr. Ayodele Emmanuel Ikudayisi	Snr. Lecturer	08038548824	Architectural Science
17	Dr. Olawale Oreoluwa Olusoga	Snr. Lecturer	08087654838	Urban Sustainability, Housing
18	Dr. Oladunni O. Adegunloye	Lecturer I	08038076027	Urban Design Studies

9.6.2. DEPARTMENT OF BUILDING

POSTGRADUATE DIPLOMA (PGD) IN BUILDING

POSTGRADUATE DIPLOMA PROGRAMME (PGD) IN BUILDING

1. PROGRAMME OFFERED

Postgraduate Diploma in Building (PGD Bldg)

2. PROGRAMME PHILOSOPHY

This programme is designed for those who wish to bridge their academic career from the practical oriented course (Higher National Diploma) to a more theoretical course (Post-Graduate Diploma) in Building or those who wish to improve their academic career to the more theoretical, research - based studies in the University, and subsequently pursue higher degree course. The goal is also to produce top-class professionals who are able to understand, sustain and enhance the ever-dynamic construction industry. The PGD programme will develop professionals in construction and other related fields on skills needed to succeed in the built environment and also enable both fresh graduates and practicing Builders to acquire more theoretical and practical knowledge through taught courses and research works.

3. PROGRAMME OBJECTIVES

The graduates of this programme should be able to:

i. have an in-depth knowledge on construction materials and components;
ii. provide sound financial advice on new and rehabilitation projects;
iii. effect and supervise the necessary construction, repairs, maintenance of building projects; and
iv. get familiar with legal and ethical issues relevant to construction project executions.
v. enable the candidates with HND to further their academic career.

4. PROGRAMME JUSTIFICATION

The practice of building in the 21st century faces new challenges because of advances in new construction materials and methods. The course is structured to integrate some elements of construction and maintenance technology, construction management, building services, financial management and building laws into a single course. Graduates of the programme will be able to understand:

i. the science and technology of buildings and their various services;
ii. designs and construction technology of buildings;
iii. comprehensively construction materials and components;
iv. analyses and management of information on site;
v. the solutions to construction problems;
vi. the dynamics of new and rehabilitation projects financing;
vii. contemporary approach necessary for supervising construction, repairs and maintenance of building projects;
viii. legal and ethical issues relevant to construction project executions.

5. ADMISSION REQUIREMENTS:

The following shall qualify for admission into the Postgraduate Diploma in Building:

a. Candidates with Third class B.Tech degrees of the Federal University of Technology, Akure in Building or its equivalent from other recognized Universities.
b. Candidates with B.Tech/B.Sc degrees not less than second class lower in Architecture/Civil Engineering/Quantity Surveying/Estate Management or their equivalents from FUTA or other recognized Universities.
c. Candidates with Higher National Diploma with not less than lower credit class in Building/Architecture/Civil Engineering/Quantity Surveying from any recognized institution.
d. Holders of Higher National Diploma in Building with a pass grade and full registration with Council of Registered Builders of Nigeria (CORBON).

6. PROGRAMME DURATION

The programme on Postgraduate Diploma in Building will have a minimum duration of **3 semesters (18 - 24 Months)**. The students will be taught on full-time basis. It will involve course work and project. The third semester will involve project writing on any aspect of the taught courses as may be approved by the Department.

7. GRADUATION REQUIREMENTS

A Candidate is expected to pass a total of thirty-six **(36)** units of coursework and six **(6)** units of project work to graduate. In the case of a failed course, the candidate

must repeat the course at the next available opportunity; there is no provision for re-sit examination.

8. COURSE OUTLINE

First Semester

Course Code	Course Title	Credit Units			
		L	T	P	Unit
BDG 701	Construction Technology	2	0	3	3
BDG 703	Construction Project Management	2	0	0	2
BDG 705	Building Maintenance Technology	2	0	0	2
BDG 707	Buildability and Maintainability Analysis of Construction Project	2	0	0	2
BDG 709	Construction Plants and Equipment	2	0	0	2
BDG 711	Structural Analysis	2	1	0	3
BDG 713	Operation Research	2	0	0	2
	Total Units				**16**

Second Semester

Course Code	Course Title	Credit Units			
		L	T	P	Unit
BDG 702	Construction Health and Safety	2	0	0	2
BDG 704	Project Planning and Control	2	1	0	3
BDG 706	Building Maintenance Management	2	0	0	2
BDG 708	Research Methodology	2	0	0	2
BDG 710	Electrical Services and Lighting Design in Building	2	0	3	3
BDG 712	Reinforced Concrete Design	3	0	0	3
	Total Units				**15**

Third Semester

Course Code	Course Title	Credit Units			
		L	T	P	Unit
BDG 715	Building Materials and Applications	2	1	0	3
QSV 709	Construction Tendering and Estimating	2	0	0	2
BDG 799	PGD Research Project	0	0	6	6
	Total Units				**11**

9. COURSE SYNOPSES

BDG 701 CONSTRUCTION TECHNOLOGY 3 UNITS

The course deals with specialized topics in construction technology. Topics covered include: site investigations, foundations, industrialized and traditional building systems, long span roofing systems, Builders' documents, retaining walls, water retaining structures, tanking in foundations, construction of roads, culverts and bridges, embankment stabilization, dams and cofferdams, railways, construction in deep waters- piers and caissons, river works- jetties, harbours, docks, breakwaters, tunneling, engineering landfill site.

BDG 702 CONSTRUCTION HEALTH AND SAFETY 2 UNITS

The nature of building construction projects, accidents statistics in construction; Need of safety for man and structures; construction risks and hazards; history and concept of safety in manufacturing, ergonomics; safe-work and safe-working environment; accident analysis and reporting, legal requirements for safety e.g. Insurance Act 2004; builders' project health and safety plan: health and safety policy, objectives of the plan; Assessment of hazards and risks; responsibility and organization for safety; accident analysis reporting and prevention measures; permit to work; access and egress from workplace; underground obstructions and buried services. First aid; Protective clothing and equipment; erection and inspection of scaffolds, false-work etc; fire prevention and protection procedure; control of substances hazardous to health; emergency procedure; health and safety training; health and safety records.

BDG 703 CONSTRUCTION PROJECT MANAGEMENT 2 UNITS

This course deals with the general practice of project management. Topics of study include characteristics and constraints of projects, defining and evaluating project objectives, projects stakeholders and stakeholders' requirements. Methods of managing projects, project development, project finance, projects delivery systems, project portfolio management, project contracts and procurement, project execution, coordinating and controlling projects, and closing and commissioning of projects. It also deals with management of project sites, pretender planning, method statement, material management, quality management, coordination of subcontractors and specialist firms, project management as a procurement method. Introduction to lean construction and management.

BDG 704 PROJECT PLANNING AND CONTROL

The course deals with the sequence, organization and control of projects and the interrelationship between various professional groups involved in the development of capital projects. The nature of capital projects – client, consultants and contractors. Planning techniques: Concept of planning, purpose of planning, types of planning technique, specific uses and features e.g. Bar chart, Critical Path Methods (CPM), Line of balance, Horse Blanket etc. emphasis on control tools e.g maintenance schedule, labour schedule, equipment schedule, site layout, management of subcontractors/supplying, BOQ and the budget statement. Financing capital projects; working capital flow of funds. Legal implication of building contract. Regional organization of typical professional offices. Productivity studies in the construction industry, meaning of productivity, factors affecting productivity, measurement of productivity, work study, work measurement, method study, activity study, foreman delay survey,incentives, motivation.

BDG 705 BUILDING MAINTENANCE TECHNOLOGY 2 UNITS

This course deals with definition of building maintenance and terms (alteration, conversion, extension, improvement in buildings), building standards, decay of building and agencies involved, building deterioration agencies, deterioration of building materials (concrete, timber, plastic, stones), sub-structural failure and remedial measures, lateral movement affecting structural stability, superstructure defects and remedial measures, rising dampness and remedial measures, floor slab failure, repair to cracked, etched and shelled concrete or rendered surface, maintenance of stonewalls, roof defects and remedial measures, door and window repairs, bituminous felt failure, effect of domestic fires on major building materials (timber, concrete, steel), maintenance of building services (electrical services, water supply and waste disposal problems).

BDG 706 BUILDING MAINTENANCE MANAGEMENT 2 UNITS

The course deals with management aspect of building maintenance, essentials of maintenance and facilities management, the maintenance organization, theory and practices of management and its application to maintenance, basic function of maintenance organization (advisory function, central administrative system), maintenance organization structure, in-house/outsourced maintenance staff, maintenance procurement (building survey and report writing, schedule of dilapidation, maintenance profile), failure prediction tools- a statistical approach (maintenance economies, maintenance planning techniques, allocation problem in maintenance), facilities management and queuing theory (motivation theory, financial and non-financial incentives schemes, the geared incentive scheme, effect of operative's performance level on project cost, effect of bonus on project cost), inventory control, Computerized Maintenance Management Systems (CMMS).

BDG 707 BUILDABILITY AND MAINTAINABILITY ANALYSIS OF CONSTRUCTION PROJECTS 2 UNITS

This course introduces students to the concept of buildability and maintainability analysis; Builders' works and quality control, determination of Buildable Design and construct-ability score (BDAS, CAS, CONPLAN); usage of Naviswork Clash Detection Module or Solibri Model Checker to analyse the buildability of Building Designs; systems of improving the buildability and maintainability of buildings. Introduction to international code of practice on buildability and maintainability analysis; relationship between buildability, maintainability, sustainability and other project requirements, as well as case studies.

BDG 708 RESEARCH METHODOLOGY 2 UNITS

Research Techniques and writing skill. Research and tools for analysis. Meaning of research, types of research, tools for research (e.g. Questionnaire). Research planning and design planning. Review of literature, nature of data/research methodology, research proposal. Presentation of research results. The use of elementary statistical analysis in problem solving - Frequency distributions, histograms, cumulative frequency graphs; Collection, tabulation and pictorial presentation of data; Measures of location and Dispersion; mean, median, mode, standard deviation, variance. Probability and probability distributions; Sampling and sampling distributions; normal distribution, student's 't' distribution Chi-square (x^2) distribution, 'f' distribution; Statistical Estimation and Tests of Significance. Regression and Correlation analysis. Analysis of Variance (ANOVA); one-way and two-way ANOVA etc.

BDG 709 CONSTRUCTION PLANTS AND EQUIPMENT 2 UNITS

Technical improvements in construction plant and equipment have caused a movement away from manual labour towards mechanization of construction sites. This course examines material handling equipment (MHEs), water pumping equipment (WPEs), pile driving

equipment (PDEs), earthmoving equipment (EMEs), mixing and paving equipment (MPEs), rock and earth drilling equipment (REEs), aggregate production equipment (APEs), truck and hauling equipment (THEs), determination of plant outputs and efficiencies, selection and utilization of plants and equipment, economic comparison of plant alternatives, plant profitability and acquisition, plant cost and hire rate, plant maintenance, hand tools for builders.

BDG 710 ELECTRICAL SERVICES AND LIGHTING DESIGN IN BUILDING 3 UNITS

This course introduces students to how electricity is generated, transmitted, distributed and supplied into buildings, basic electrical installation in buildings and tariff systems. Contents include basic electrical theory and terms, power system (generation, transmission and distribution processes), power generation (transmission and distribution processes), supply and distribution to buildings; residential, commercial, industrial and large multi-storey buildings, controls and protection of installation; fuses and circuit breakers, switches and outlets, conductors and cables (cable sizes and types, circuits (sizes, rating, voltage drop and earthing), electricity supply regulations, electrical installation (phase system and wiring system; conduit, surface and trunking systems), economics of supply (metering and scale of tariff of energy supplies in buildings, load-factors, power factors and power factor correction), design of electrical services for simple and complex buildings.

BDG 711 STRUCTURAL ANALYSIS 3 UNITS

Deflection analysis of statically indeterminate structures (double integrator method, Macaulay's method, conjugate beam method, moment area method), analysis of statically indeterminate trusses (application of work/energy method), analysis of statically indeterminate beams and frames using three moment equations, slope deflection equations and Hardy Cross method of moment distribution.

BDG 712 REINFORCED CONCRETE DESIGN 3 UNITS

Introduction to reinforced concrete structures. It covers properties of steel and concrete, and the design of typical building elements in accordance with design-BS8110, serviceability limit states (cracking, deflection, anchorage, bond and curtailment), design of singly reinforced concrete beams and doubly reinforced, rectangular and flanged beams including design for shear reinforcement. The design and detailing of simple one-way slab, two-way slab and staircases. Design and detailing of columns (axial columns, columns subjected to uni-axial and bi-axial bending, slender columns), design of reinforced concrete walls, foundations (pad axially and eccentrically loaded , wide-strip and combined) and retaining walls.

BDG 713 OPERATION RESEARCH 2 UNITS

Application of operation research to problems of planning in industry and business with particular reference to construction industry. Nature of operation research, resources, constraints and optimization in site and contract management. Problem solving case studies of simple construction activities using - Linear Programming methods, Transportation problem, Assignment problem, Queuing problem. Inventory control of construction materials. Replacement theory. Markov theory and its Application to Human Resources problem in the construction industry.

BDG 715 BUILDING MATERIALS AND APPLICATIONS 3 UNITS

Detailed study of the following materials clay, concrete, stones, timber, plastics, bricks, paints, metals and alloys, glass, bitumen, synthetic, reinforced polymer products and innovative building materials under the following headings: physical and chemical properties, composition, classifications and types, production, defects, treatment and testing. Case studies of materials in building. Concrete technology (cement, lime, pozzolanic materials, additives and admixtures, aggregates, mix design, fresh and hardened properties of concrete, variants of concrete geo-polymer concrete, SCC, FRC, self-healing concrete, laterised concrete, , testing of concrete destructive and non-destructive testing of concrete , development of new building materials/adaptation.

BDG 799 PGD RESEARCH PROJECT 6 UNITS

Students will be allowed to carry out research in a chosen area of Building under the supervision of an academic staff. The result of the research-able topic should be creative and should be able to proffer solutions to practical problems in the construction industry.

MASTER OF TECHNOLOGY DEGREE PROGRAMMES IN BUILDING

MASTER OF TECHNOLOGY PROGRAMMES

1. PROGRAMMES OFFERED

(a) Master of Technology in Construction Management

(b) Master of Technology in Building Structures

2. PROGRAMME PHILOSOPHY

The general philosophy of the programme is to develop and advance the science and practice of building technology - construction Management, building maintenance, building structures and building services. The graduates of the Programme are to devote greater part of their lives addressing the enormous needs in the country with respect to production of buildings to the required quality, time and cost schedules; as well as evolving new techniques in all aspects of the building process. The Master of Technology programmes in Building will also develop highly skilled professionals with the requisite scientific, technological and managerial know-how. The programme will as well equip the graduate on how to sustainably produce, manage and maintain buildings bearing in mind the economic, social, technological and environmental factors associated with the performances of buildings. It will equally instill independence and originality of thought in the candidate for their endeavour in the construction industry.

3. PROGRAMME OBJECTIVES

The programmes leading to Master of Technology degrees in the Department of Building are designed to achieve the following objectives which are to:

i. provide advanced academic courses for students who desire to undertake further studies and research in different aspects of Building;
ii. develop and apply the student's intellectual qualities, technical ability and critical judgement expected in the building profession;
iii. conduct research relevant to the technological development of the country and contribute to technical knowledge;
iv. prepare high level manpower to meet with the demand in the construction industry research institutes, government establishments and institutions of higher learning in the country;
v. establish research areas which will lead to the improvement of design, management, maintenance method and use of buildings in the increasingly globalized world; and
vi. produce competent, skilled and creative building professionals that are capable of creating sustainable environment.

4. PROGRAMME JUSTIFICATION

The Master of Technology programme will allow students take new courses focusing on emerging trends in building and the built environment. This will allow the curricula keeping pace with new developments in the construction of buildings and maintenance; also keep up the standards which the Department is known for. It is also necessary to provide students with cutting edge knowledge to enable them compete favourably anywhere in the world.

5. ADMISSION REQUIREMENTS

Candidates for Master of Technology programme must have any of the following:

i. at least a B.Tech/B.Sc degree with Second-Class honours (Lower Division) of the Federal University of Technology, Akure or other recognized Universities in Building/Building Technology.
ii. at least a B.Tech/B.Sc degree with Second-Class honours (Lower Division) of the Federal University of Technology, Akure or other recognized Universities in Architecture, Estate Management, Civil Engineering, o and Building Maintenance options.
iiii. at least a B.Tech/B.Sc degree with Second-Class honours (Lower Division) of the Federal University of Technology, Akure or other recognized Universities in Civil Engineering for Building Structures option.
iv. possess a Post Graduate Diploma in Building with at least Upper Credit from the Federal University of Technology, Akure or other recognized Universities in Building/Building Technology.

6. PROGRAMME DURATION

The duration of the M.Tech programme shall be as follows:

Full-Time: a minimum of 18 months and maximum of 24 months

7. GRADUATION REQUIREMENTS

The degree of Masters of Technology in Building shall be awarded to a candidate who has satisfactorily completed a course of instruction totaling 27 units made up of 21 units of compulsory courses and 6 units of elective courses. In addition, students must carry out independent research and submit a thesis based on an original work on an approved topic. The candidate must successfully defend the thesis in an oral examination. External and University examiners will be appointed for the examination in line with the University's practice for research thesis.

8. COURSE OUTLINE

M.Tech Construction Management Option

First Semester

Course Code	Course Title	Credit Units			
		L	T	P	Unit
BDG 801	Advanced Management in Construction I	3	0	0	3
BDG 803	Advanced Building Economy and Industrial Organization	3	0	0	3
BDG 805	Advanced Research Methods and Statistics	2	0	0	2
BDG 807	Advanced Health and Safety in Construction	2	0	0	2
	Elective				3
	Total Units				**13**

Students are expected to take any one course from the following electives.

BDG 809	Advanced Construction Methodology	2	0	3	3
BDG 811	Advanced Management Information Systems	3	0	0	3

Second Semester

Course Code	Course Title	Credit Units			
		L	T	P	Unit
BDG 802	Advanced Management in Construction II	3	0	0	3
BDG 804	Advanced Construction Plant and Equipment	3	0	0	2
BDG 806	Advanced Buildability and Maintainability	3	0	0	3
BDG 808	Advanced Building Codes and Regulation	3	0	0	3
	Elective				3
	Total Units				**14**

Students are expected to take any one course from the following electives.

QSV 804	Applied Contract Law and Administration	3	0	0	3
BDG 810	Work Study Applied to Building	2	0	3	3
BDG 812	Advanced Labour Management	3	0	0	3

Third Semester

Course Code	Course Title	Credit Units			
		L	T	P	Unit
BDG 899	Student Independent project	0	0	12	12

M.Tech Building Structures

First Semester

Course Code	Course Title	Credit Units			
		L	T	P	Unit
BDG 805	Advanced Research Methods and Statistics	2	0	0	2
BDG 817	Advanced Structural Analysis I	3	0	0	3
BDG 819	Advanced Building Materials and Structures	3	0	0	3
BDG 821	Advanced Design of Reinforced Concrete Structures and Concrete Practice	3	0	0	3
	Elective				3
	Total Units				**14**

Students are expected to take any one course from the following electives.

BDG 823	Advanced Structural Stability	3	0	0	3
BDG 825	Advanced Elasticity	3	0	0	3

Second Semester

Course Code	Course Title	Credit Units			
		L	T	P	Unit
BDG 808	Advanced Building Codes and Regulation	3	0	0	3
BDG 818	Advanced Structural Analysis II	3	0	0	3
BDG 820	Advanced Design of Steel structures	2	0	0	2
BDG 822	Advanced Design of Timber Structures	2	0	0	2
	Elective	3	0	0	3
	Total Units				**13**

Students are expected to take any one course from the following electives.

BDG 824	Advanced Finite Element Analysis	3	0	0	3
BDG 826	Advanced Structural Dynamics	3	0	0	3

Third Semester

Course Code	Course Title	Credit Units			
		L	T	P	Unit
BDG 899	Student Independent project	0	0	12	12

9. COURSE SYNOPSES

BDG 801 ADVANCED MANAGEMENT IN CONSTRUCTION I 3 UNITS

This course introduces the student to the theory of Management, Management objectives to includes planning, coordinating, forecasting construction planning, cost planning, cost control and scheduling of construction programme, communication and work study. procurement and contract management which includes, (traditional method, design and built, fix cost method, management method, joint venture/ partnering and private financing initiative) resource management (resource allocation, leveling, forecasting utilization and resource management process), Building Contracts and procedures, tendering and bidding, per-qualification assessment of bidder, assessment of tender document, identification of possible risk factors receipt review and award of tender.

BDG 802 ADVANCED MANAGEMENT IN CONSTRUCTION II 3 UNITS

Risk management (avoidance, transfer or retention), factors affecting building project duration, delay causes and its effect on construction method, on-site and off-site Production Methods and Control, source of construction finance, Financial accounting and control, quality management, (planing, assurance and control), Personnel management, human resource management (recruitment, training, remuneration, appraisal, dis-engagement), Industrial Relations, site and office administration. the use of statistical concepts of probability, Construction digitization, building management and influence of economic factors and communication within the construction industry will be discussed.

BDG 803 ADVANCED BUILDING ECONOMY AND INDUSTRIAL ORGANIZATION 3 UNITS

The importance of economics in construction management is covered in this course. Business objective: the allocation of resources; market mechanism, Demand theory - indifference analysis, supply theory, Production function, costs models of market behaviour, monopoly competition, discrimination monopoly, imperfect competition, behavioural theories, factor markets, the remuneration of factors of production, definition and measurement of National income. The circular flow of income, consumption saving investment. Fluctuations in general and building activity. The role of money, interest rates, inflation, International trade, government economic policy; government intervention, location of fabrication and assembly, transport costs, scale of economic activity, comparison between construction and other industries, integrated diversification mergers; legislation, restrictive practices, experience in construction industry. The structure of and communication within the construction industry, implication for cost quality and growth of output.

BDG 804 ADVANCED CONSTRUCTION PLANT AND EQUIPMENT 2 UNITS

This course covers the importance of construction equipment in the production of buildings, typical construction equipment, Classifications, Performance and their relative cost advantage. Plant and Equipment – management, selection, brands, mode of acquisition and use, operation, maintenance and safety measures. The annual cost, depreciation, replacement and scraping of construction equipment. Influence of tax in buying of new equipment the development of appropriate basic equipment for developing countries. Hiring /buying/leasing plant and equipment making and buying building materials and products.

BDG 805 ADVANCED RESEARCH METHODS AND STATISTICS 2 UNITS

This course covers introduction to research, analyzing problems and identifying research topics, developing a research proposal, planning and executing research, literature review, modern bibliography search techniques, Tools for data collection- instrument for data collection, survey design, case study, Interview, sampling techniques. Data analysis - descriptive statistics and inferential statistics, analyzing data using SPSS software, Excel and Stat Graphics. Writing technical report, dissertation and papers. Hypothesis testing, tests of significance and their interpretations, analysis of variance, correlation and regression analyses.

BDG 806 ADVANCED BUILDABILITY AND MAINTAINABILITY 3 UNITS

Buildability; Concepts and principles, Development of Concepts of Buildability; Benefits of good buildability, Barriers to implementation of Buildability, the search for better buildability. Strategies for buildability; the need for buildability, projects aspects influencing buildability, the construction process, strategies for the construction process. Buildability in conceptual planning and procurement; conceptual planning for buildability, procurement options, traditional contraction, etc. Buildability in design; design buildability, design factors influencing buildability. Buildability in the construction phase; the contractor's responsibilities, design solution, techniques of assembly, personnel organization, site organization and layout, project communications, operational control. Buildability in use; maintenance – a total process approach, the requirements for maintenance and repair, capital project management. Buildability case studies.

BDG 807 ADVANCED HEALTH AND SAFETY IN CONSTRUCTIO 2 UNITS

Main characteristics of construction industry directly associated with construction safety. Safety culture definitions, characteristics of a safety culture, types of safety culture, and culture change management. Health and Safety Management Systems (Definitions of Safety Management Systems, overview of OSHMS standards – BS 8800, OSHAS 18001, HSG 65, ILO-OSH 2001, and ISO 45001, benefits of OSHMS in the construction industry). Elements of Occupational Health and Safety Management Systems (Elements of OSHMS in ISO 45001, OSHAS 18001, HSG 65, ILO-OSH 2001, BS 8800). Development of health and safety policy for an organization. Health and safety planning, implementations and control. Assessment of hazards and risks in each element of construction. Development of Health and safety plan for a construction project ISO 45001 standards. Assessment and implementation of Risk Control Plan. Safety performance measurement. Lagging indicators of safety performance – Total Record-able Incident rate (TRIR), Lost Time Cases (LTC), Days Away Restricted or Job Transfer (DART), and Experience Modification. Rate (EMR). Leading indicators of safety performance measure. Accidents and incidents investigation process. Reporting of accidents. Formation and duties of Health and Safety Committee in an organization. Housekeeping at Construction site. Selection and utilization of appropriate PPEs at site. Ergonomics in project delivery process.

BDG 808 BUILDING CODES AND REGULATIONS 3 UNITS

History of building codes(in Nigeria & outside Nigeria). Aim of building codes and regulations. A review of codes and regulation from planning control and application viewpoints. National building codes, States Codes, Local Codes and other regulating agencies of relevance to the construction industry. Special studies in fire health and safety, materials specification etc standards and the practically of some known standards. Control of building works: meaning of building works and requirements relating to building works. An expose of the Nigerian national building code: design requirements (architectural, engineering); design for the physically challenged; construction requirements; administration and enforcement etc. Meaning and composition of contract documents in the building code; inspection and testing; compliance forms; roles of respective professionals; supervision of construction works by Architects and Engineers in line with their inputs; the special place of building Production management. Building classification and compartmentalization. Fire resistance requirements of elemental past of buildings. Non-combustibility requirements for stair ways: provision of cavity walls/barriers and fire stopping/control e.g. sprinklers, hose reels in specified situations. Ventilation and means of ventilation. Water supply, drainage and waste disposal requirements. Requirements for commencement of building work: building plans and permits. Compliance with the regulations developer's role and the enforcing authority's role.

BDG 809 ADVANCED CONSTRUCTION METHODOLOGY 3 UNITS

The objective of this course is to provide adequate knowledge on the theory and practice of design and construction of buildings. Design methods and production processes. Production Methods and Processes on the Building sites. The influence of large unskilled labour on design and Construction Methodologies Reshaping the value judgement of design and production terms in the construction industry.

BDG 810 WORK STUDY APPLIED TO BUILDING CONSTRUCTION 3 UNITS

Introduction to Workers Preference and Productivity Studies, Time Study-Principle Procedures and Applications. Work measurement Principles Procedures and Application. The use of activity sampling on the Building Sites-Practical applications, difficulties and prospects job evaluation and value engineering

investigation of alternatives financial and non-financial incentives workers attitudes.

BDG 811 ADVANCED MANAGEMENT INFORMATION SYSTEMS 3 UNITS

Introduction to Management Information Systems: Components- technology, people, and process; basic history; Application of MIS in business; MIS Basics – Hardware, Software, Networking, and Security: compare and contrast hardware and software; identify the primary components of a computer and the functions they perform; describe the two primary categories of software; describe the advantages and disadvantages of cloud computing for companies; define the term open-source and identify its primary characteristics; identify the types of networks and their general functions; identify the information security triad; and describe the tools used to secure information technologies; Data and Databases: Data, Information Knowledge, Data Management, Databases, purpose of a database management system; describe the characteristics of a data warehouse; define data mining and describe its role in an organization; and list the components of knowledge management; Information Systems Development: explain the overall process of developing a new software application; explain the differences between software development methodologies; differentiate among types of programming languages used to develop software; name and describe the major phases in the development of websites and mobile applications; and identify existing implementation policies; Information Systems and the Construction Industry : identify the issues experienced by the construction industry as they face a global economy; identify criteria for the ethical use of information systems in the construction industry; define intellectual property; explain the protections provided by copyright, patent, and trademark; describe the challenges that information technology brings to individual privacy; and describe future trends in information systems in construction.

BDG 812 ADVANCED LABOUR MANAGEMENT 3 UNITS

History and development of industrial relations. Environmental influences on labour relations (LR), participants in LR, workplace procedures (communication, representation, grievances, discipline and dismissal). The role of employers' associations in construction. The structure of employers' associations. The role of the trade unions. Management responsibilities in industrial relations. Empowerment and worker participation. The industrial relations machinery. Collective bargaining structures and process negotiation. Disputes and disputes resolution (conciliation, arbitration and industrial action); guidelines for discipline and dismissal, managing performance, ill-health, absenteeism and discipline, disciplinary procedures and hearings, substantive fairness of misconduct, incapacity and operational requirements dismissals. The human relations aspect of motivation and worker behaviour. The industrial relations system and the interacting roles of unions. Employers and Government. Liability for negligence. Health and safety at work. Aspects of employment law. Contract, agency, torts, negligence, etc.

BDG 817 ADVANCED STRUCTURAL ANALYSIS I 3 UNITS

Analysis of statistically indeterminate frames and arches by the slope-deflection, moment distribution, including Kani's method, area-moment and column analogy methods. Influence lines method for continuous beams and frames. Force and displacement methods of matrix structural analysis applications to beams, frames, grids, etc. Two- and three-dimensional problems in theory of elasticity in plates, shells and bars under various loading conditions: propagation of waves in elastic media.

BDG 818 ADVANCED STRUCTURAL ANALYSIS II 3 UNITS

Elastic analysis of plane and space frames, elastic instability of members and frames. Plastic analysis of plane and space frames, incremental collapse, alternating plasticity and shakedown, influence of axial loads and instability on plastic collapse loads, failure loads, deflection of members after yielding begins, natural frequencies of vibration, dynamic response to impulsive loads: fatigue; approximate methods of analysis. Finite element methods torsion Fracture mechanics of structural materials and appropriate usages; non-destructive testing, in-situ testing, creep and deflection in concrete crack with perdition.

BDG 819 ADVANCED BUILDING MATERIALS AND STRUCTURES 3 UNITS

The structure and use of currently applied building materials. The functional adequacy of existing methods. Application of existing materials including local ones to new situation. Advanced Construction Techniques. Appropriate production techniques for manufacturing building materials locally. Practices and Procedures in the use of other Building materials. The use of new materials for structural purposes, Specifications. Quality control of concrete in its various applications. The design of concrete mixes to produce concrete. The

Laboratory efforts for large-scale production Field operations and laboratory testing of samples models and full-size structural members precast concrete and pre-stressed concrete practice. Effect and failure in concrete works and products including remedies. Fire effects on concrete.

BDG 820 ADVANCED DESIGN OF STEEL STRUCTURES 2 UNITS

General introduction to the design of tension, compression and flexural members and the design of connections. Design of column base plate, connection of column to foundation, stiffness, cased columns, plate girders, portal frames and gantry girders. Design of multi-storey steel structures.

BDG 821 ADVANCED DESIGN OF REINFORCED CONCRETE STRUCTURES AND CONCRETE PRACTICE - 3 UNITS

Advanced topics in reinforced concrete design using ultimate strength Deflections and shear strength calculations under different loading conditions of beams, beam – columns, slabs etc. Compression members. Two-way slab, flat Torsion Composite construction. Introduction to pre-stressed concrete, Special problems in design. Quality control of concrete in its various applications. The design of concrete mixes to produce concrete. The Laboratory efforts for large-scale production Field operations and laboratory testing of samples models and full-size structural members precast concrete and pre-stressed concrete practice. Effect and failure in concrete works and products including remedies. Fire effects on concrete.

BDG 822 ADVANCED DESIGN OF TIMBER STRUCTURES 2 UNITS

General introduction to timber as a structural material, design standards and structural design of tension, compression and flexural members and connections. Design of glued laminated timber members. Design of built-up timber beams and columns and stud timber wall. Design of arches and shells.

BDG 823 ADVANCED STRUCTURAL STABILITY 3 UNITS

Buckling of columns for various loading conditions. Stable and unstable equilibrium. Buckling load of tapered columns. Elastic stability of framed structures. Lateral and torsional stability of beams and beam-columns. Beams on elastic foundation. Inelastic stability of columns. Bending and buckling of plates and shells.

BDG 824 ADVANCED FINITE ELEMENT ANALYSIS 3 UNITS

Basic concepts of finite element technique. Application of finite element method to elastic problems in plane stress and plane strain. Plate bending; shell analysis, structural stability and non-linear problems. Survey of numerical methods applied to finite element method. Finite element software, equation solvers, eigenvalue routines and schemes for direct integration. Band and front minimizer, sub-structuring.

BDG 825 ADVANCED ELASTICITY 3 UNITS

Stress – Strain analysis. Field equations and boundary value problems. Variational method of the theory of elasticity – Bending, buckling and torsion. Complex variable methods. Three dimensional problems. Elastic waves. Vibrations. Introduction to plasticity. Stress spaces, loading path yield surface. Various deformations and incremental theories. Boundary value problems of plasticity.

BDG 826 ADVANCED STRUCTURAL DYNAMICS 3 UNITS

Behaviour of one-degree and multi-degree systems under free and forced vibration. Normal frequencies and modes of vibration. Analytical and numerical methods of analyzing the response of structures – Viano-Stadola, Rayleigh-Ritz and methods of obtaining eigenvalues and eigenvectors of normal vibration. Lang-range equation. Model analysis of multi-degree systems. Static analysis of the earthquake problem. Dynamic seismic analysis. Concepts and techniques of seismic design.

DOCTOR OF PHILOSOPHY PROGRAMMES IN BUILDING

PROGRAMMES OFFERED

(a)_Doctor of Philosophy in Construction Management
(b) Doctor of Philosophy in Building Structures

PROGRAMME PHILOSOPHY

The philosophy of the programme is conceived to equip student with the spirit of enquiry, instill discipline, independence, originality of thought and problem-solving techniques and to develop highly skilled professionals that are intellectually empowered with contemporary knowledge-based in building production, management, use and maintenance of building.

PROGRAMME OBJECTIVES

Graduate programmes leading to Ph.D. Degrees in the Department of Building are designed to achieve the following objectives which are to:

i. provide advanced academic courses for students who desire to undertake further studies and research in different aspects of Building;
ii. prepare high level manpower to meet with the demand of the construction industry research institutes, government establishments and institutions of higher learning in the country;
iii. establish research areas which will lead to improvement in the design, management, and maintenance method and use of buildings in the increasingly globalized world;
iv. produce graduates with knowledge, skills and competence in research and development in construction management, materials technology and building services systems; and
v. broaden opportunities for students' attainment of self-actualization in the building construction industry based on the trend of development at the local and international levels and to be able to create sustainable built environment.

PROGRAMME JUSTIFICATION

The Ph.D programmes in Building are specifically directed towards providing academics and professional practitioners the opportunities for further studies and research with a view to acquiring a body of more advanced and sophisticated analytical tools which are essential for sound and effective decision making in - construction management practices, building maintenance managements, building structures analysis and design and building services. It is also necessary to provide students with cutting edge knowledge that will enable them compete favourably anywhere in the world.

ADMISSION REQUIREMENTS:

i. Candidates for Ph.D. must have M.Tech or M.Phil. degrees of the Federal University of Technology, Akure or its equivalent in fields or specializations related to their proposed courses and must have a minimum **CGPA 3.50** on a grade of **5.0** or **60** .
ii. A candidate registered for degree of Master of Philosophy (M.Phil.) programme for not less than two semesters and who in the coursework, has shown exceptional ability may be transferred to Ph.D, subject to the Regulation of Postgraduate School.

PROGRAMME DURATION

The duration of the Ph.D. programme will be **36-48 months** after M.Sc/M.Tech./M.Phil for full-time students and **48-60 months** for part-time students as may be considered appropriate by the Board of Postgraduate School.

GRADUATION REQUIREMENTS

i. In order to be eligible for the award of Ph.D Degree in all the fields of specializations in the Department, the main consideration shall be based on the recognition of the candidate's high attainments and scholastic ability in his specialization. This is demonstrated by a continuous independent research work successfully completed under the general supervision of selected senior academic staff. The Ph.D thesis emanating from the research project is expected to demonstrate originality and power of independent investigation, creativity thought and work. The product of the research must form a definite contribution to knowledge.

ii. **BDG 999: Doctor of Philosophy's Thesis Research Project 12 UNITS**

This should consist an independent work with sound theoretical and investigative approach in a chosen area of Construction Management, Building Maintenance, Building Structures and Building Services leading to an original contribution to knowledge. Every candidate must present at least three successful seminars, post survey oral presentation and published at least two papers in a reputable journal before the submission of Ph.D thesis for Oral Examination in an Open defense. The thesis format must be in accordance with FUTA standard.

LIST OF ACADEMIC STAFF IN THEW DEPARTMENT OF BUILDING

Academics

S/	Name	Rank	Qualification	Area of Specialization
1	Dr. O. Alake	Reader and Acting Head of Department	B. Eng., (FUTA), M.Sc., Ph.D. (OAU) MNIOB, R.Bldr. MTRCN	Building Materials and Structures, Construction Technology
2	Prof. D. R. Ogunsemi	Professor	B.Sc., M.Sc., (OAU), Ph.D. (FUTA), FNIQS, FNIOB, RQS, R.Bldr.	Cost Management, Procurement Studies, Housing Studies & Project Management
3	Professor A. F. Lawal	Professor	B.Sc., M.Sc., P.hD (OAU), FNIOB, FIDFPM, R.Bldr., ANIST, MNATE.	Material Management, Project Procurement, Design Management and Project Management.
4	Dr. P. O. Akanni	Reader	B.Sc., (ABU), PGD., (FUTA), M.Sc., (UNIBEN), M.Phil., (OAU), Ph.D (USM, Malaysia), MCIArb, MNIOB, R.Bldr., QAA (Certified).	Construction Resources Management, Operation Research, Quality Management, Research Methodology
5	Dr. (Mrs) V. O. Akinola	Senior Lecturer	B.Sc., (JABU), M.Sc., Ph.D. (UNIZIK), FNIOB, R.Bldr.	Buildability & Maintainability, Professional Practice.
6	Dr. E. A. Ijigha	Senior Lecturer	B.Tech., (FUTMINA), M.Sc. (UNIJOS), PhD (FUTA) MNIOB, R.Bldr.	Building Materials, Construction Management, Construction Resources Management, Industrialized Building System
7	Dr. O. O. Ekundayo	Lecturer I	B.Sc., M.Sc., (ABU), Ph.D (FUTA)	Building Structures, Construction Technology
8	Dr. I. Albert	Lecturer I	B.Sc., M.Sc., (ABU), Ph.D (South Africa) MNIOB, R.Bldr.	Construction Resources Management, Quality Management,
9	Mr E. O. Omoniyi	Lecturer I	B.Sc., M.Sc., (OAU)	Construction Management, Material Management and Sanitation in Building.
10	Mr. A. O. Osadola	Lecturer II	B.Tech (FUTMINNA) M.Sc., (OAU)	Building Structures, Construction Technology

9.6.3 DEPARTMENT OF ESTATE MANAGEMENT (ESM)

1 AVAILABLE PROGRAMMES

A. Postgraduate Diploma (Estate Management)

B. Master of Technology (M. Tech.) Estate Management

C. Doctor of Philosophy (Ph D.) Estate Management

D. Master of Real Estate (MRE) Program

POSTGRADUATE DIPLOMA (ESTATE MANAGEMENT

Philosophy and Objectives

The programme is designed as both a terminal and conversion programme directed specifically to:-

(i) provide an opportunity for further study and training in estate management/land economy for those in practice.

(ii) help those who may wish to make up their deficiencies in their first degree especially to be able to pursue second-degree programmes.

(iii) bridge the gap between the Higher National Diploma and first degree in Estate Management in order to allow the former to pursue higher degree programmes.

Admission Requirements

Candidate for admission to the programme should possess any of the following qualifications:

(i) B.Tech (3rd Class degree) or equivalent in Estate Management of the Federal University of Technology, Akure or any other recognized University.

(ii) H.N.D (lower credit and above) in Estate Management from a recognized polytechnic or college of Technology.

In addition, an applicant may be required as a condition of admission to undergo a selection process.

Programme Duration

The Programme runs for duration of a minimum of three semesters on full time basis and a maximum of four semesters.

Requirement for Graduation

Candidate must complete 42 units, which consist of 36 units of course work, and 6 units project dissertation. The project dissertation will span over the two semesters and will be based on original independent work on an approved topic to be supervised by academic members of staff. A panel of examiners will assess this during an oral examination.

COURSE STRUCTURE

1st Semester

Course Code	Course Title	L	T	P	U
ESM 701	Principles and Practice of Valuation				3
ESM 703	Principles and Applied Property Management				3
ESM 705	Investment appraisal and property development				4
ESM 707	Construction Management.				3
ESM 709	Urban Economics and Structure				3
	TOTAL				**16**

Second Semester

Course Code	Course Title	L	T	P	U
ESM 702	Plant and Machinery Valuation				3
ESM 704	Rating and National Taxation				3
ESM 706	Legal Studies I				3
ESM 708	Basic Research Methods and Computer Application				3
ESM 710	Dissertation				3
	TOTAL				**15**

YEAR II

First Semester

Course Code	Course Title	L	T	P	U
ESM 720	Project Dissertation II				3
ESM 721	Housing Process and Applied Regional Planning				3

ESM 723	Land Use and Resource Development				3
ESM 725	Real Estate Finance				3
ESM 727	Legal Studies II				3
ESM 799	**Final project**				**6**
	TOTAL				**15**

COURSE DESCRIPTION

ESM 701: Principles and Practice of Property Valuation 1

Fundamental valuation methods, Application of the principles and methods to the valuation of various interests in Landed property. Valuation of Assets of a company, Going concern valuation. Valuation For Insurance, Mortgage Rating, Probate e.t.c. Surrender and Renewal of leases. Rent Control Regulations and the effects on value of properties. Valuation for compulsory purchases – valuation of special types of properties (petrol filling stations, hostels etc) Farm/Rural valuation, mineral valuation.

ESM 702: Plant And Machinery Valuation

Definition of value and valuation, Economic basis of property value, functions of plant and machinery valuer. Manufacturing process- primary and secondary processing. Identification of plant and machinery- micro and macro identification. Inventory taking, Approaches to plant and machinery valuation.- cost , investment and comparison methods. Depreciation and obsolescence factors in plant and machinery valuation.Asset valuation.

Principles & Applied Property Management

Management organization and functions, management theory. Aims and policies of property management. Land and housing policies of the various government, Management surveyors role – Marketing space, selecting tenants, leasing advice, collection of rents, chasing arrears, insurance, etc Port folio advice. Maintenance, improvement and modernization of buildings, maintenance problems, surveys and administration, life cycle costing, etc.

ESM 704: Rating & National Taxation

Income tax, nature and incidence. Allowances and deductions. Assessment of owners and occupier of landed property. Taxation of capital, Estate Duty, Capital Transfer Tax. Organisation and Administration of Rating. Assessment of properties, the valuation list and its preparations (objectives, proposals and appeals).

ESM 705: Investment Appraisal and Property Development

The nature of investment projects, investments decision process, feasibility & Viability Indicators. Traditional and modern methods of appraisal techniques. The construction & building industry, public & private controls over development, physical limitation and financial constraints. The Development Team & process, project supervision and management, Monitoring and Evaluation.

ESM 706: Legal Studies 1

Elements of Law of tort. General principles of tort, Tort affecting land, Negligence, nuisance trespass, strict liability etc.

Elements of law of contract: Formation of contract, parties to a contract, void, violable and unenforceable contracts. Formation of contracts, remedial for breach etc.

Administrative law:- the machinery of government, the separation of power, the legislative, the executive, organization of courts and their jurisdictions, Administrative tribunals; the personnel of law, Remedy for administrative misconduct such as interlocutory in junction.

ESM 707: Construction Management

ESM 708:Basic Research Methodology and Computer Application

The use of Elementary statistical analysis in problem solving. Theory and practice of urban research design and operationalization. Multiple and partial correlations. Analysis of time-series data; simple and multiple regression analysis and their application. The use of computer – spread sheets, word processing etc. computer application to property management, valuation, investment analysis etc

ESM 709: Urban Land Economics & Structure

The economics of urbanization, theories of urban structure & growth. Location of economic activities. The urban land market. Economic aspects of urban valuation. Economics development & Transportation.

ESM 710 & ESM 720: Dissertation

ESM 721: Housing Process AndApplied Regional Planning

Applied Regional Planning:

Planning standards, methods of collection organization and selection of planning data. Preparation of surveys and analysis of sources of information. Planning models and their relevance. Planning problems of large metropolitan complexes. Principle of planning for development & redevelopments, urban renewal etc.

Housing Process :

Housing as a basic human necessity, a major land use component an integral component of urban and regional development. The universality of the housing problem Classification of dwelling by building materials,

location, tenure and design variables

Assessing housing needs in quantitative and qualitative terms at the local, state and national levels. Population structure, household size and composition, replacement needs. Housing in relation to rural community development, the concept of standards and housing demands. Housing design and construction process.

ESM 723: Land Use And Resource Development

Proprietary land use analysis, social and legal theories of property. Implementation and progress of land reforms in selected countries. National land policy, conservation of natural resources, environmental pollution and control. Environmental ImpactAssessment.

ESM 725:Real Estate Finance

The Nature of Investments, Real estate as an investment. Source of development Capital, control and management of working capital, budgeting and finance forecasting. Sources and Mechanism of real estate finance etc.

ESM 727:Legal Studies II. Elements of land law:-

The principles of English land law, historical outline of the development of freehold and leasehold estate, and interests. Legal and equitable interest in land, pledges, pawns, Mortgages and their nature in common law, Equity and Nigerian Law. The Role of lands in indigenous Nigerian society & economy. The nature of landholdings. Statute law dealing with land registration, Acquisition and administration, compulsory acquisition and state grants. Arbitration and Awards. The nature of arbitration, its origin and application to valuation. Expert evidence and proof of evidence.

B Master of Technology (M. Tech.)/ Doctor of Philosophy (Ph D.) Estate Management

1. Objectives of The Programmes.

Postgraduate programme in Estate Management are specifically directed towards providing academics and professional practitioners opportunities for further studies and research with a view to acquiring a body of more advanced and sophisticated analytical tools which are essential for sound and effective decision – making in land valuation, land development, land management and land use control. The specific objectives of the programmes include:

(a) Producing high level graduates capable of handling policy matters relating to the development of Nigeria property industry;

(b) Identifying research into theoretical concepts with a view to relating them to the practical solution of problems in the property industry;

(c) Equipping graduate with the necessary tools for the advancement of knowledge particularly in the field of estate management;

(d) Promoting to a deeper level, their capability in the professional management aptitude and;

(e) Widening the eligibility areas of applicants that could take advantage of the programme, thus increasing the manpower supply in the field of estate management.

2. Admission Requirements.

Candidate must possess any of the following qualifications in addition to satisfying the general University regulations for admission.

(i) B. Tech. in Estate Management with at least Second Class Honours (Lower) of the Federal University of Technology,Akure or its equivalent.

(ii) Postgraduate Diploma in Estate Management with a minimum of B average (Upper Credit) of the Federal University of Technology,Akure.

3. Programme Duration.

The M. Tech. Programme will be full-time for a minimum of 18 months. The PhD programme is 36 months Full-Time or 48 months Part-Time after the Master's degree.

4. Requirements for the Award of Degree

Candidate must complete a minimum of 28 Units course work and 12 Units of research to be qualified for an award of the M. Tech. Degree. A candidate for an award must conduct research and present thesis based on original independent work on an approved topic and pass an oral examination based on the thesis. The Ph.D degree is awarded mainly on the recognition of the candidate's high scholastic ability in research, the product of the research being a definite contribution to knowledge in the area.

1. Research Interests in the Department.

The department encourages research work in the following areas:

(a) Real Estate InvestmentAnalysis

(b) Property Valuation

(c) Property Management

(d) Property Industry/Property Market Structure

(e) Real Estate Finance

(f) Urban Economic Analysis/Environmental Management/Conservation Strategies

(g) Rural Development and Forestry

COURSE STRUCTURE

M. TECH. First Semester

Course Code	Course Title	L	T	P	U
ESM 801	Advanced Valuation				2
ESM 803	Urban Economics and Structure				2
ESM 805	Seminar in Feasibility and Viability studies				2
ESM 807	Real Estate Equity Investment and Administration				2
ESM 809	Land Resources regulation and enterprise management				2
ESM 811	Research Methodology I				2
ESM 813	Housing Process and Policy				2
	TOTAL				**14**

2nd Semester

Course Code	Course Title	L	T	P	U
ESM 802	Real Estate Finance				2
ESM 806	Urban and Regional Administration in Nigeria				2
ESM 808	Resource Use and Environmental Policies				2
ESM 810	Real Estate Investment Portfolio Management				2
ESM 812	Rural Environment and Policies				2
ESM 822	Research Methodology II				2
ESM 814	Research Project I & II				12
	ELECTIVES				2
	TOTAL				**26**

Plus one Elective from any of:

Course Code	Course Title	L	T	P	U
ESM 816	Seminar In Property / Facility Management				2
ESM 818	Plant and Machinery Valuation				2
ESM 804	Urban Land Economics and Public Policy				2

7. Course Description

ESM 801: Advanced Property Valuation and Appraisal

Fundamental Valuation Models. Valuation as a guide to business decisions. Appraising residential and income properties. The development of appropriate valuation techniques for use in Nigeria including a consideration of alternative to conventional valuation approaches. Valuation of Sacred Places. Disturbance, compulsory acquisition and compensation problems.

ESM 802: Real Estate Finance

Mechanisms of Real Estate Finance, Sources of Funds, Loan Contracts, Principles of Mortgage Equity analysis. Role of government Agencies. Latest developments in Nigerian Mortgage Industry. The Nigerian Financial Environment and Real Estate Finance. The Impact of Fiscal and Monetary Policies on availability of mortgage credit.

ESM 803: Urban Economics/Structure and Dynamics

Nature and Structure of Urban Economics Location of Economic activity; Economic Analysis in an Urban Framework; Principles of Urban Economic Development, Housing, Poverty and unemployment. The theory of land price and the structure of property markets in urban areas. The impact of fiscal policies. The Economics of Building Development. Urban Land Use Succession Theory.

ESM 804: Urban Land Economics and Public Policy

Urban Land Policy as expressed in the institutional devices and practices which mold economic decisions and actions relative to land use in metropolitan areas; zoning, comprehensive plans, official maps, building codes, subdivision regulations, taxation, and urban renewal legislation treated with an economic and planning emphasis. Urban economic structural growth, enterprise development and urban area socio-economic dynamic. Factor in urban area growth and economic change, Locational interdependence and consumer behaviour preferences.

ESM 805: Seminar in Feasibility and Viability Appraisal

Feasibility research technique and appraisal theories applied to actual case situation in the field. Students may be expected to work in teams on selected projects. Philosophic basis of research technique; case applications to problems of urban land economics.

ESM 806: Urban and Regional Administration in Nigeria

Urbanization and related phenomena. The nature, characteristics and development of urban areas. Theories of urban growth and developments,. Relationship between urban areas, politics, services, employment, pollution, revenue generation and community, development. Regional planning and administration. The relationship between regional and local agencies.

ESM 807: Investment Appraisal & Decision Analysis

The investment media, real estate as an investment: investment strategy and objectives. The real estate market and its characteristics; real estate as an investment; risk and return characteristics; techniques of appraisal; discounting and non discounting; Capital rationing, weighted cost of capital, inflation and real estate investment. Introduction to performance measurement and portfolio management.

ESM 808: Resources Use and Environmental Policies

Competitive land resources usage. Compatible and incompatible uses. Land capability and classification. Environmental regeneration conservation.Recycling of land. Environmental influenced on modes of production. Land policy and environment. Resource data bank.

ESM 809: Land Resources Regulations and Enterprise Management

Basis principles of the law affecting the use of land and natural resources including legal remedies and defenses available to the private sector. Land Use and Resource Conservation. National Economy and implications for real estate decision making. An overview of Nigeria's land resources and conservation strategies. Impact of Man's activities on Natural Resources.

ESM 810: Real Estate Investment Portfolio Management

Scope, rational and techniques of portfolio management. Fundamental and Technical Analysis, Portfolio Analysis-Expected Return, Risk reduction and diversification benefits.; Risk-Return calculations of Portfolios; Portfolio Selection and Revision;. Perfomance measurement and analysis. Construction of perfornance index.

ESM 811:Research Methods and Techniques I

Theory and practice of urban research design and operationalization. Types of research, Research design, Research topic selection, Instrument of Data Collection **techniques, Data Analysis techniques, data Presentation** methods, Application of Computer packages to research, Research reporting styles, and Citation of references; Elementary statistical analysis.-Measure of Central Tendency and Spread; T-Test and Analysis of Variance. Non parametric statistics.

ESM 812: Rural Environment and Policies

Conflicts between users of the rural land. Agricultural and Rural Development in Nigerian. Economics of small farms. Development of the village. Problems of remote areas; possible solutions. The institutional background to rural amenity and recreation. National and regional parks. Forestry and economic development. Recreation problems and policies in Nigerian. Principles of economy, eco-systems and modern world. Rural industrialization in integrated rural development. Land policy and rural development.

ESM 813: Housing Processes and Policies

Economic principles and problems of housing demand; supply and market analysis Functioning in an institutional setting of private practices and governmental policies of control and assistance. The business of creating housing including strategy, market and merchandising trends, legal and political constraints site collection procedures and financial analysis and control, single case studies emphasizing rental property management and federally subsidized projects for lower income families. The formulation of housing policies and programmes in Nigeria. Comparative Survey and analysis of housing policies in different countries of the world. Housing as a sector of investment and integral part of national development plans in Nigeria. Approaches to the identification of housing needs the determinants of standard and criteria in the design of houses.

ESM 822: Research Methods and Techniques II

Correlations Analysis; Regression Analysis- Simple, Multiple, Non Linear, Qualitative Response, Panel Data Model;Analysis of Time-Series data.

D. MASTER OF REAL ESTATE (MRE) PROGRAMME

1. ROGRAMME OFFERED: Master of Real Estate (MRE) -Professional
2. DEGREE OPTIONS
   a) Master of Real Estate (MRE) (Land Management)
   b) Master of Real Estate (MRE) (Plant and Machinery Valuation)
   c) Master of Real Estate (MRE) (Facilities Management)

3. PROGRAMME PHILOSOPHY

The Master of Real Estate (MRE) degree programme has

been designed to meet the contemporary and future demands of real estate industry. Since the nature and scope of the industry have changed and are changing dramatically over the years, there is the need for the advancement in the knowledge, techniques and tools required for decision making in the industry. One of such areas is the need to advance knowledge in the principal areas of specialization in the industry; this is what this programme is set to achieve. The programme is designed for professionals and executives in the industry who desire to acquire advanced knowledge.

4. PROGRAMME OBJECTIVES

The MRE programme aims at providing opportunities to gain advanced knowledge and acquire techniques that are essential for efficient and effective real estate decision making with a view to improving professional and managerial performance of the practitioners. The specific objectives of the programme are to:

(a) provide high-level manpower capable of handling policy matters relating to Land Management, Plant and Machinery Valuation and Facilities Management;.

(b) acquaint real estate professionals with the recent advances and analytical tools in the industry and equip them with the ability to apply these to the solution of theoretical and practical land resources problems; and

(c) develop and enhance professional competence in order to produce practitioners that have entrepreneurial skills of value for self-employment in the real estate industry.

5. ADMISSION REQUIREMENTS

Candidate must possess any of the following qualifications in addition to satisfying the general University regulations for admission:

a. B. Tech.in Estate Management with at least Second Class (Honours) Lower Division of the Federal University of Technology or the equivalent.

b. Postgraduate Diploma in Estate Management with a minimum of Lower Credit of the Federal University of Technology,Akure or any recognized University.

c. Candidates who possess a minimum of a Second Class (Honours) Lower Division First Degree in Mechanical Engineering or Production Engineering may be admitted into Facilities Management or Plant and Machinery Valuation option.

d. Candidates who possess a minimum of a

Second Class (Honours) Lower Division First Degree in Electrical Engineering; Building; Architecture; or Quantity surveying may be admitted into Facilities Management option

e. Candidates who possess a minimum of a Second Class (Honours) Lower Division First Degree in : Law; Urban & Regional Planning; Land Surveying may be admitted into Land Management option.

PROGRAMME DURATION.

The MRE Programme runs for duration of a minimum of eighteen months on a full time basis and a mminimum of 24 months on a part time basis

REQUIREMENTS FOR THE AWARD OF DEGREE.

Candidate for the different MRE degree options must complete the minimum course units as specified below to qualify for an award of the MRE degree:

Land Management Option: 51 units

Plant and Machinery Option: 51 units

Facilities Management Option: 55 units

The minimum course unit must include 6 Units of Masters Project Report.

6. COURSE STRUCTURE

First Year

First Semester (All Options □

Course Code	Course Title	L	T	P	U
ESM 801	Advanced Valuation	2	1	-	3
ESM 807	Investment Appraisal & Decision Analysis	2	1	-	3
ESM 815	Real Estate Economics	2	1	-	3
ESM 817	Real Estate Law	2	1	-	3
ESM 819	Information Management and Computer Application	1	-	6	3
	TOTAL				**15**

Second Semester

Land Management Option

Course Codes	**Course Titles**	**L**	**T**	**P**	**U**
ESM 820	Land Information Management	1	0	6	3
ESM 822	Land Policy and Reform	2	1	0	3
ESM824	Urban land Management	2	1	0	3
ESM 826	Conservation and Land Resource Management	2	1	0	3
ESM 828	Environmental Valuation	2	1	0	3
	TOTAL				**15**

Plant and Machinery Option

Course Code	Course Title	L	T	P	U
ESM 830	Plant and Machinery Valuation I	2	1	-	3
ESM 832	Industrial Economics and Process	2	1	-	3
ESM 834	Principles of Insurance	2	1	-	3
ESM 836	Financial Management Principles	2	1	-	3
ESM 840	Asset Maintenance Management	2	1	-	3
	TOTAL				**15**

Facilities Management Option

Course Code	Course Title	L	T	P	U
ESM 840	Asset Maintenance Management	2	1	0	3
ESM 842	Principles and Practice of Facilities Management	2	1	0	3
ESM 844	Space Planning and Management	2	0	0	2
ESM 846	People & Organizational Management in the Built Environment	2	1	0	3
ESM 848	Facilities Project Management (Theory and Practice)	2	0	3	3
ESM 850	Piped and Fire Services	2	0	0	2
	TOTAL				**16**

Second Year

First Semester Land Management Option

Course Codes	Course Titles	L	T	P	U
ESM 821	Land Administration	2	1	-	3
ESM 823	Seminar in Land Use and Control	-	-	9	3
ESM 825	Gender, Informal sector and Land Accessibility	2	1	-	3
ESM 827	Compusory Acquisition and Compensation	2	1	-	3
ESM 829	Land Law	2	1	-	3
ESM 877	Master's Project Report	-	-	18	6
	TOTAL				**21**

Plant and Machinery Option

Course Codes	Course Titles	L	T	P	U
ESM 831	Plant and Machinery Valuations II	2	1	0	3
ESM 833	Plant and Machinery Valuation Report Writing	1	0	6	3
ESM 835	Principles of Machine Tools and Factory Equipment	2	1	0	3
ESM 837	Field Trips and Industrial Visits	0	0	9	3
ESM 845	Business Management for Built Environment Professionals	2	1	0	3
ESM 877	Master's Project Report	0	0	18	6
	TOTAL				**21**

Facilities Management Option

Course Code	Course Title	L	T	P	U
ESM 837	Field Trips and Industrial Visits	0	0	9	3
ESM 841	Financial Planning and Control of Facilities	2	1	0	3
ESM 843	Indoor Quality and Built Environmental Performances	2	1	0	3
ESM 845	Business Management for Built Environment Professionals	2	1	0	3
ESM 847	Electrical Systems, IT and Intelligent Buildings	2	1	0	3
ESM 849	Sustainable Practices in Facilities Management	2	1	0	3
ESM 877	Master's Project Report	0	0	18	6
	TOTAL				**24**

ESM 801: Advanced Valuation 3 Units

Fundamental Valuation Models; Valuation as a guide to business decisions; Appraising residential and income properties; The development of appropriate valuation techniques for use in Nigeria including a consideration of alternative to conventional valuation approaches. Valuation of Sacred Places; Disturbance, compulsory acquisition and compensation problems

ESM 807: Investment Appraisal and Decision Analysis 3 Units

The investment media, real estate as an investment: investment strategy and objectives. The real estate market and its characteristics; real estate as an investment; risk and return characteristics; techniques of appraisal; discounting and non discounting; Capital rationing, weighted cost of capital, inflation and real estate investment. Introduction to performance measurement and portfolio management.

ESM 815: Real Estate Economics 3 Units

Market theory: supply and demand analysis, factors influencing demand and supply, and market equilibrium. Supply and Demand factors influencing property values. Elasticity of supply and demand, shift of equilibrium and its applications to the construction market. Functions of the Real Property market, The pricing of land and land resources, Investment in real property, Public sector development: Cost-Benefit Analysis, Housing, Economic Theory and public finance, The incidence of taxation on land resources, The impact of government Macro policy on land and property resources.

ESM 817: Real Estate Law 3 Units

General principles of tort affecting land, negligence; nuisance trespass, strict liability; liability for animals, employers liability to workmen, defenses and liability of occupier. Formation of a contract, parties to a contract;void and voidability of a contract, termination of contracts; remedies for breach. Special topics: sales of land and goods; agency, the legal position of auctioneers and estate agents, insurance etc. hire purchase. The meaning and inter-relationship of ownership, possession and title; Pledges and pawns. Mortgages and their nature; Basic principles of Land UseAct of 1978.

ESM 819: Information Management and Computer Application 3 Units

Information in decision making; information in management; the information technology; applications of information technology; Property information needs; property information sources; Introduction to business management software – spread sheets, word processing, Auto Card, Data base, Management system. Simple software which are of direct application to investment analysis in relation to Estate Management practice e.g. Computerized valuation, computerized asset and Inventory valuation, computerized agency and property management systems. The Estate Surveyor and the internet.

ESM 820: Land Information Management 3 Units

Land RecordsAnd Information systems, land registration and transfer processes; cadastral or mapping of ownership; case study of computerization of land registration system; problems of inter-ministerial collaboration in LIM; Land Information Management as an aid to decision making; application of GIS to land management; spatial data infrastructural development; e-land transaction process; bureaucracy in land information management; organizational approach to land information management; man power development for land information management; factors mitigating against efficient land information management in Nigeria.

ESM 821: Land Administration 3 Units

Methods of disposal of Government land; Conditions of grant of C of O; land administration problems and practice; structure and functions of various Government departments and agencies associated with land administration in Nigeria; subsequent transactions in formal and informal land market, Land acquisition, allocation and revocation.

ESM 822: Land Policy And Reform 3 Units

Land policy formulation: Implementation of land policies; specialized institutions of land policies; classification of land tenure systems; principles of alienation and occupation of public land; meaning of land reform; land reform objectives and strategies; purpose and progress in national land reforms in selected countries.

ESM 823: Seminar In Land Use and Control 3 Units

Student is expected to present an independent seminar on any area of land use and control.

ESM 824: Urban Land Management 3 Units

Urbanization and Land Use & Values Patterns, Value Determination – Accessibility and Complementarily, Urban Land Use and Transportation, Congestion, Traffic and Parking. Technology and the city spatial structure growth. The Urban Economic Base, Pollution and Environmental Quality in Nigeria, An Overview of Environment - Oriented Policy Measures in Nigeria Urban Policy. The need for policy. Argument for and Against urban policy formulation. Antecedent and Contemporary Urban Policy Measures in Nigeria, New Town Development: Public and private; Planning and the compensation /Betterment problem.

ESM 825: Gender, Informal Sector and Land Accessibility 3 Units

Concept of Land Accessibility: Measurement of accessibility of land; qualitative and quantitative parameters; Formation of land rights; procedure, benefits and effects on women's tenure. factors governing accessibility of land; gender issues in accessibility of land and property right: barriers to women's access to right and property right; Supply side and demand side factors; gender, land use, and urban livelihood; women in agricultural and home based enterprises; Nature and constituents of Nigerian informal sector: types of Informal sector employment and their land use; squatter business premises on public land; urban transportation and poverty alleviation; urbanization and the growth of informal sector; informal sector and access to land: sources of finance for the informal sector; informal land market and security of tenure; mechanisms for management of land related disputes.

ESM 826: Conservation and Land Resource Management 3 Units

Identification of Land resources for Conservation purpose; Cause of environmental degradation and the need for conservation in Nigeria; Urbanization and Conservation: Changes in patterns of Land Use; Ecotourism as a tool for conservation; management of tourist centres (natural and man-made); reclamation of land and management of coastal land; desert encroachment and soil erosion mitigation; the role of the market in land resources allocation; management of national monuments and historic buildings.

ESM 827: Compulsory Acquisition and Compensation 3 Units

Principles of the laws of compulsory purchase and compensation, Evaluation of Public Land Acquisition: Public Lands Acquisition Act., 1917; the Land Use Decree and provisions for compensation; Variation in Compensation – Southern and Northern States. The Importance of Publication of Compulsory Acquisition Notice: Survey Description; Notice to treat; Mode of publication and service of notice; Making claim and counter claim; Acquisition by Oil Companies: Rights and privileges of a license; Joint Venture Companies; The Crucial Role of Land in the petroleum industry; Fair and Adequate Compensation; Acquisition process; Assessment of Compensation; Crop Enumeration; Compensation for annual crops; Alternative Methods of Assessment to Adequate compensation; Oil pollution claims. Compensation for Ecological Disturbance in the Petroleum Industry, compensation for injurious affection and disturbance; electricity, way leaves, service easements, pipelines and gas installations; Need for Reform.

ESM 828: Environmental Valuation 3 Units

An overview of the environment, environmental economics, Valuation of environmental resources, environmental values; categories of environmental values- use value; indirect use values; non-use values and intrinsic values; risks and uncertainty in environmental restoration programme; valuation and environmental contamination, theory and methods used in the valuation of properties with impairments or detrimental conditions, outlining valuation tools for analyzing real estate damages and the impaired condition

ESM 829: Land Law 3 Units

The principles of English land and law, Historical outline of the development of freehold and leasehold estates and interests, legal and equitable estates and interest in land; Pledges and pawns, Mortgages and their nature. The role of land in indigenous Nigerian society and economy, the nature of land holdings,creation of family ownership, customary forms of alienation, dealings with family property, Compulsory acquisition and state grants. Registration of titles of family land. Land UseAct of 1978.

ESM 830: Valuation Of Plant And Machinery I3 Units

The valuation process; basis of plant and machinery valuation – existing use value, alternative use value, going concern etc; macro and micro identification of plants and equipment. What constitutes plant and machinery and equipment for purposes valuation? Items exempted from plant and machinery valuation; Methods of valuing plant and machines, cost method, market ;approach, income approach. Depreciation and Obsolescence in plant and machinery valuation; factors that affects depreciation and obsolescence; methods of computing depreciation and obsolescence.

ESM 831: Plants And Machinery Valuation II 3 Units

Detailed examination of plant and machinery valuations for insurance, sale, balance sheet, takeover and merger purposes, privatization and commercialization etc. examination of the application of standards to asset valuation practice; tales of estate surveyors, engineer and accountant in plant and machinery valuation in Nigeria.

ESM 832: Industrial Economics and Process 3 Units

Nigeria industrial history and economics- a wider appreciation of the impacts of Nigeria economic policies (SAP, Privatization and Commercialization of government assets etc) on plant and machinery values; financing industrial properties; location of industries; materials and processes in manufacturing- general knowledge of raw materials, plants and production process of industries such as textiles, iron and steel, food, canning and drinks, timber processing, cement manufacturing.

ESM 833: Plants and Machinery Valuation Report Writing 3 Units

Each student would be made to carry out inspection and write valuation reports on at least five different types of real life industrial properties for mortgage, sales, purchase, insurance, proof of evidence, merger and acquisition.

ESM 834: Principles of Insurance 3 Units

Theory and practice of insurance and its economic and social significance; basic life, health, and property-liability insurance for organizations and families; review of the major lines of insurance; insurance and major risks associated with real estate; concepts of reinstatement and indemnity; depreciation and cost method of valuation for insurance purpose.

ESM 835: Principles of Machine Tools and Factory Equipment 3 Units

Introduction to material processing-nature of manufacturing; organizational structure of manufacturing, and industrial materials; casting and molding; forming; separating; conditioning; assembling; and finishing; process design and control; factory layout and design; power equipment, transportation equipment and conveyors; machine tools.

ESM 836: Financial Management Principles 3 Units

Accounting theory and methods; asset and liability valuations; budgeting and cash flow analysis; decision making based on cost data; industrial, commercial and residential property finance; interpretation and comparison of financial statements, management of working capital, budgetary planning and control, capital budgeting techniques, preparation of financial proposals for facilities management activities ; relevance of depreciation.

ESM 837: Field Trips and Industrial Visits 3 Units

Students are expected to make field trips and visit related industries both on individual and group bases in order to familiarize with the actual practice in the industry. They are expected to submit reports on their visits for assessment.

ESM 840: Asset Maintenance Management 3 Units

Basic definitions, concepts and principles of facilities maintenance: maintenance defined; maintenance generators; facilities maintenance work elements; maintenance cycles; planning factors; life of building; total building costs; life cycles of materials, components and services; service systems operation/maintenance cycles; factors influencing maintenance and replacement including economic considerations; maintenance profiles; Maintenance policy and standards; planned and responsive maintenance; asset appraisal and evaluation; information management; maintenance; property portfolios; acquisitions and disposals.

ESM 841: Financial Planning and Control of Facilities 3 Units

Resources management and control: facilities maintenance budget composition; long-term budget; medium- and short-term budgets; budgetary planning and control ,requirements development; reimbursable services; administration of service charge accounts; institutional operating plan/program operating plan; financial control; budget preparation; subdivision of budget; types of costs; cost indices; stock control; space; relocation issues; taxation; facilities performance and financial management.

ESM 842: Principles and Practice of Facilities Management 3 Units

Principles and practice of facilities management for general facilities offered in the industry. Development, implementation and management of facilities management strategy; Support services management; strategy for the provisions of support services; ordinances and regulations relating to the operational management of facilities and support services

ESM 843: Indoor Quality and Built Environmental Performances 3 Units

Air-conditioning, Heating system, Mechanical ventilation, Indoor air quality, HVAC control, Commissioning, operation and maintenance, Plant operation and preventive maintenance and servicing, Energy conservation, Energy management opportunities and priorities, Energy management systems, Energy codes. Thermal effect on building, Condensation in buildings, Natural ventilation, Thermal comfort, Photometry and lighting comfort, Interior lighting, Exterior lighting, Day lighting, Sound and people, Sound transmission, Room acoustics, Sound measurement and noise control, and Miscellaneous environmental performance indicators.

ESM 844: Space Planning and Management 2 Units

Space management and space use; Space strategy; Impact of structure and services on space use; Preparing briefs for office layouts; Managing changes in accommodation; furniture arrangement, selection and specification; effect and constraints of structure and services on layout; space and operation; requirements of customers; buildings Ordinance and Regulations and other relevant legislation related to the alteration and addition work and use of space.

ESM 845: Business Management For Built Environment Professionals 3 Units

Professional firms: sole proprietorship, groups, consortium, partnerships, their organization and management; Office Procedure and management – Organization of personnel, job description, chain of authority, departmentalization, specialization; office organization- office records; communication and coordination; office procedures- cash flow, management

ESM 846: People and Organization Management in the Built Environment 3 Units

Perspectives on management theory; organisational environment; organisational objectives, strategic planning; organisational structure; organisational culture; motivation and leadership; teamwork and team building; management of organisational change; interpersonal and organisational communication, Concept and philosophy human resource management; human resource planning; recruitment and selection, training and development; performance and appraisal; remuneration and compensation systems; job design; communications and consultation; industrial relations.

ESM 847: Electrical Systems and Intelligent Buildings 3 Units

Components of internal and external electricity supply systems of buildings, and their standard ratings; General regulations of installation and maintenance of electrical services of buildings: power supply system (main and emergency/back-up), Earthing and Lightning protection schemes; communication, monitoring, and access control systems.

ESM 848: Facilities Project Management (Theory and Practice) 3 Units

Common Facilities Management projects; project managers' roles and functions; life cycle costing; risk management; project targets and briefs; project planning; master programme; short-term programme; stage programme; critical path analysis; bar charts; PERT; precedence network; progress control; cost control; cash flow analysis; project evaluation and financing; project information and documentation.

ESM 849: Sustainable Practices in Facilities Management 3 Units

Contemporary issues in FM; assessment procedures, and standards for sustainable and strategic facilities issues; sustainability, energy management: field installation energy management, employee involvement initiatives, metering, energy surveys and project planning, improved facilities operation and maintenance, energy conservation investments and energy savings performance contracts., waste management: avoidance, minimization, recovery/recycling/re-use, bulk reduction and disposal of general waste and specialist areas such as construction and demolition materials, hazardous chemicals, clinical waste and confidential waste,, the working environment, and comfort and productivity in the workplace.

ESM 850: Piped and Fire Services 2 Units

Fire hydrant and hose reel systems, Sprinkler systems, Automatic fire alarm and detection systems, Fixed gas systems, Smoke control system, Passive fire protection including means of escape and means of access for firefighting and rescue, Services water characteristics and treatment, Cold and flushing water supply systems, Hot water supply systems, Sewage disposal and treatment, Refuse disposal and chemical disposal systems, Swimming pools water supply systems, and Relevant local ordinances, regulations, codes of practice and standards.

ESM 877: Master's Project Report 6 Units

Each student is expected to present a report on a case study in any area of interest to be approved by the department.

LIST OF ACADEMIC STAFF IN ESTATE MANAGEMENT DEPARTMENT (ESM)

S/N	Names	Qualification	Status	Area of Specialization
1	Prof. Adebakin Simeon ASAJU	Ph.D (ESM) M.Sc (ESM) B.Sc (ESM)	Professor	Rental Housing Market Analysis
2	Prof. Mustapha Oyewole BELLO	Ph.D (ESM) M.Sc (Const. Mgt) B.Sc (ESM)	Professor	Property Valuation, Real Estate Investment Analysis and Land Management
3	Prof. (Mrs.) Victoria Amietsenwu BELLO	Ph.D (ESM) M.Tech (ESM) B.Sc (ESM)	Professor	Property and Environmental Valuation, Investment Analysis.
4	Prof. Michael Adedayo ADEBAYO	Ph.D (ESM) M.Sc (Const Mgt) B.Sc (ESM)	Professor	Urban Land Use Economics
5	Prof. Mukaila Bamidele OGUNLEYE	Ph.D (ESM) M.Sc (ESM) B.Sc (ESM)	Professor	Spatial Housing Analysis, and property Management
6	Prof. (Mrs.) RashidatAdejoke OLADAPO	Ph.D (ESM) M.Tech (ESM) B.Sc (ESM)	Professor	Urban Land Economics and Real Property Market Analysis
7	Prof. Babajide OJO	Ph.D (ESM) M.Tech (ESM) B.Tech (ESM)	Professor	Real Property Development and Land Information Management
8	Prof. Amos Olaolu ADEWUSI	Ph.D (ESM) M.Tech (ESM) B.Tech (ESM)	Professor	Real Estate Finance.
9	Dr. Akuakanwa Eziukwu NWOSU	Ph.D (ESM) M.Tech (ESM) B.Sc (ESM)	Reader	Portfolio Management and Housing Market Analysis
10	Dr.Michael Ayodele OLUKOLAJO	Ph.D (ESM) M.Sc (ESM) B.Sc (ESM)	Senior Lecturer	Property Valuation and Compensation
11	Dr. Nnaemeka BetheIEZEOKOLI	Ph.D (ESM) M.Tech(ESM) B.Tech (ESM)	Senior Lecturer	Real Property Valuation and Investment Analysis
12	Dr. David Ngwoke MBAZOR	Ph.D (Const Mgt) M.Sc (International Project Mnagement) B.Tech (ESM)	Senior Lecturer	Housing Delivery and Property Management, Construction Project and Facility Management
13	Dr. Victor Olutope IGE	Ph.D (ESM) M.Tech (ESM) B.Tech (ESM)	Senior Lecturer	Urban Land Administration and Policy & Real Estate Valuation

9.6.4 DEPARTMENT OF INDUSTRIAL DESIGN (IDD)

PROGRAMMES OFFERED

a) Postgraduate Diploma in Industrial Design (PGD IDD)

b) Masters of Technology in Industrial Design (M.Tech)

c) Doctor of Philosophy in Industrial Design (Ph.D**)**

AVAILABLE OPTIONS/SPECIALIZATION

a) Ceramics

b) Graphics

c) Textiles

PHILOSOPHY AND OBJECTIVES OF THE PROGRAMMES

a) Postgraduate Diploma in Industrial Design (PGD IDD)

The Department trains students to advance the necessary creative and aesthetic skills that are needed in Industrial design. The field of Industrial Design is varied and each of its special areas can be developed as separate field of study. The programme deals with visual, aesthetic and technical proficiency in ceramics, graphics, textiles, interior and metal design. Industrial Design also considers the importance of such features as shape, configuration, ornament or pattern that could give visual appeal to manufactured products in two and three dimensional forms.

Objectives of the Programme:

The objectives of the programme are to:

(I) Serve as bridge programme for holders of Higher National Diploma (HND) certificates and equivalent qualifications that are desirous to proceed to the M.Tech (IDD) programme of the Department

i) Develop students' ability to resolve visual communication problems relating to the Industrial design andApplied Art subject matters.

ii) Train students as designers for key design roles in Industrial Design practices and in related field.

iii) Develop individual designers who have the ability to work in the industry or to set up their own studio.

iv) To train individuals who can contribute to the continuing regeneration of tradition and industry through design innovation, technical understanding and individual excellence.

b) Master of Technology (M.Tech) Industrial Design

The Master of Technology Degree in Industrial Design is designed to equip candidates with more specialized technological knowledge in the following ways:

i. Creative skills and technical know-how in studio practical skills in studio practices;

ii. Imaginative leadership and knowledge to coordinate gained experiences; and

iii. Control in design and industrial processes in the areas of Ceramics, Graphics, Printing and Textile design.

Objectives of the Programme: The programme has been designed to:

a. enhance in students the development of professional, industrial and technological skills in specialized areas as specified above.

b. provide advanced studies in Industrial Design and related programmes through research and course work of lectures, seminars and practical studio experiments.

c. meet the manpower requirements for the teaching of Art and Design programmes at post-secondary institutions in Nigeria.

d. merge scientific investigation of research with aesthetic ideals and production processes so as to provide a broad spectrum of prototype design and production processes for relevant indigenous industries.

e. provide opportunities in Nigerian Universities of Technology to meet higher management manpower needs in Industrial Design, production processes and developments.

c) Doctor of Philosophy (Ph.D) in Industrial Design

The degree of Ph.D in Industrial Design with the field of specialization in Ceramics, Graphics and Textiles are designed to prepare highly qualified individuals for distinctive achievement in the combination of scientific knowledge with indepth design thinking in solving design real life problems in the profession area of their choice professional areas/feilds.

The specific objectives of the programme are to:

(i) Enhance the development of professional and independent research in specialized areas of Industrial Design.

(ii) Promote the manpower staff development requirements for teaching and research in Industrial Design; in order to enhance the continued existence of the system.

(iii) Merge scientific investigation with aesthetic ideals and be adequately vast in a broad spectrum of prototype design for related indigenous industries.

ADMISSION REQUIREMENTS

a) Postgraduate Diploma in Industrial Design (PGD **IDD)**

Candidates for admission to the programme should possess any of the following qualifications:

i. B.Tech in Industrial Design or its equivalent with at least Third Class Degree in Applied Art in any of the available option with a minimum of Second Class (Honours) of the Federal University of Technology, Akure, Nigeria or any equivalent degree in Industrial Design or Applied Arts from a reputable University in Nigeria or Overseas.

ii. Postgraduate Diploma in Industrial Design of the Federal University of Technology,Akure with a minimum of Upper Credit in addition to any HND pass at credit level in any accredited Nigerian Polytechnic in any area of specialization mentioned above.

b) Master of Technology (M.Tech) Industrial Design

Candidate must possess any of the following qualifications in addition to satisfying the general University regulation for admission.

i. B.Tech in Industrial Design or Applied Art in any of the optional areas of specializations mentioned above with a minimum of second class honours of the Federal University of Technology, Akure or any equivalent degree in Industrial Design or Applied Art from a reputable University in Nigeria or other places.

ii. Postgraduate Diploma in Industrial Design of the Federal University of Technology, Akure with a minimum of Upper Credit, in addition to any HND pass at credit level in any accredited Nigerian Polytechnic in any area of specialization mentioned above.

c) Doctor of Philosophy (Ph.D) in Industrial Design

The degree of Doctor of Philosophy in Industrial Design of the University of Technology, Akure is principally by research. Candidate must possess any of the following qualifications in addition to satisfying the general University regulation for admission.

i) M.Tech degree in Industrial Design of the Federal University of Technology,Akure;

ii) Equivalent Master's Degree in Industrial Design/Industrial Art or Applied Arts of recognized Universities;

iii) A research proposal of about 400 typewritten words stating emphatically the research and proof of ability to pursue independent advanced research in the field of study;

iv) Candidates below an overall grade of B at Master's degree level are not eligible for admission as there are no pre-doctoral programme**.**

DURATION OF THE PROGRAMMES

a) Postgraduate Diploma in Industrial Design (PGD IDD): The course shall be on part-time basis and will run for three (3) academic semesters.

b) Master of Technology (M.Tech) Industrial Design: Full time students shall normally be required to spend between eighteen (18) and twenty-four (24) months.

c) Doctor of Philosophy (Ph.D) in Industrial Design:

The duration of the Ph.D programme will be for a minimum period of 6 semesters for full-time or 8 semesters for a part-time beyond the Master's degree duration.

REQUIREMENTS FOR GRADUATION

a) Postgraduate Diploma in Industrial Design (PGD IDD)

Candidates must complete a total of 44 units which consists of 32 units of course-work and 12 units of project work. The project work, which is actualized in the 3rd semester, will be supervised by academic members of staff and project report shall be assessed.

b) Master of Technology (M.Tech) Industrial Design

Candidates must complete a total of 38 units including project work which is 3 units in the 2nd semester. These are designated in the three areas of specialization. The project work is supervised by at least one supervisor who is not below the rank of a lecturer I and a have Ph.D.

Doctor of Philosophy (Ph.D) in Industrial Design

The Ph.D degree is awarded mainly in recognition of the candidates' high scholastic ability in his area of research. The product of the research must make some significant contribution to knowledge. Every candidate for a research degree must present a thesis based on his/her research. A thesis must show familiarity with previous work in the field of study and must demonstrate credible original result, all of which must be presented in good literacy style. A thesis is normally required to be candidate's original contribution to knowledge or to practice in the candidate's field.

COURSE OUTLINE

A) POSTGRADUATE DIPLOMA IN INDUSTRIAL DESIGN (PGD IDD)

First Semester

All courses in this semester are compulsory for all the three options i.e. Ceramics, Graphics & Textiles

Course Code	Course Title	L		T	P	U
IDD 701	Industrial Design Organizations and Management	1	1	0	2	
IDD 703	General Drawing	0		0	6	2
IDD 705	History & Philosophy of Industrial Design	1	1	0	2	

IDD 707	Research Methods	1		1	0	2
IDD 709	Interior Design & Decoration	1		1	0	2
IDD 711	African Crafts & Design	2		1	0	3
IDD 713	Prototype Design For The Industry	1		1	3	3
	TOTAL	**7**		**7**	**9**	**16**

Second Semester Ceramics Option (PGD)

Courses in this semester are based on student's option (Ceramics)

Course Code	Course Title	L		T	P	U
IDD 702	Ceramic History	2		0	0	2
IDD 704	Industrial/Ceramic Studio	0	1	3		2
IDD 706	Studies of Glaze and Enamel	1	0	3		2
IDD 708	Kilns/Furnaces	1		0	3	2
IDD 710	Advanced Design Studio	0	1	6		3
IDD 712	Special Project on Field Survey in Ceramics Design	0	0	6		3
IDD 730	Architectural Ceramics/Sculpture	0	1	3		2
	TOTAL	**4**		**3**	**24**	**16**

Third Semester Ceramics Option (PGD)

Courses in this semester are compulsory for all students in their various options

Course Code	Course Title		L	T	P	U
IDD 743	Project Critic Development	0	0	9		3
IDD 745	Seminar In Studio Practices	0	0	9		3
IDD 799	Practical Project In Ceramics, Graphics And Textiles Options	0	0	18		6
	TOTAL	**0**	**0**	**36**		**12**

Note: Total units to be completed by Postgraduate Diploma students as requirement for graduation in Ceramics Section

First Semester Graphic Option (PGD)

Course Code	Course Title	L		T	P	U
IDD 701	Industrial Design Organizations and Management	1	1	0		2
IDD 703	General Drawing	0	0	6		2
IDD 705	History & Philosophy of Industrial Design	1	1	0		2
IDD 707	Research Methods	1	1	0		2
IDD 709	Interior Design & Decoration	1	1	0		2
IDD 711	African Crafts & Design	2	1	0		3
IDD 713	Prototype Design For The Industry	1	1	3		3
	TOTAL		**7**	**7**	**9**	**16**

Second Semester Graphics Option (PGD)

Courses in this semester are based on student's option (Graphics).

Course Code	Course Title	L		T	P	U
IDD 714	Graphic Illustration	2		0	3	2
IDD 716	Graphic Design Studio, Publicity And Advertising	1	0	3		2
IDD 718	Computer Application To Graphics	0	1	3		2
IDD 720	Repromethods (Print Making)	0	1	3		2
IDD 712	Special Project On Field Survey In Graphics Design	0	0	9		3
IDD 732	Printing Production And Manufacturing Processes	0	1	6		3
IDD 734	Publicity And Advertising	1	0	3		2
	TOTAL	**3**		**3**	**30**	**16**

Third Semester Graphics Option (PGD)

Courses in this semester are compulsory for all students in their various options

Course Code	Course Title	L		T	P	U
IDD 743	Project Critic Development	0	0	9		3
IDD 745	Seminar In Studio Practices	0	0	9		3
IDD 799	Practical Project In Ceramics, Graphics And Textiles Options	0	0	18		6
	TOTAL	0	0	36		12

Note: Total units to be completed by Postgraduate Diploma students as requirement for graduation in Graphics Section.

First Semester Textile Option (PGD)

Course Code	Course Title	L		T	P	U
IDD 701	Industrial Design Organizations and Management	1	1	0		2
IDD 703	General Drawing	0		0	6	2
IDD 705	History & Philosophy of Industrial Design	1	1	0		2
IDD 707	Research Methods	1		1	0	2
IDD 709	Interior Design & Decoration	1	1	0		2
IDD 711	African Crafts & Design	2	1	0		3
IDD 713	Prototype Design For The Industry	1	1	3		3
	TOTAL	7		7	9	16

Second Semester Textiles Option (PGD)

Courses in this semester are based on student's option (Textiles)

Course Code	Course Title	L		T	P	U
IDD 722	Textile Industry Management	2	0	0		2
IDD 724	Computer Application in Textile Design	1	1	3		2
IDD 726	Textile Design Studio	1		1	3	2
IDD728	Fibre Technology		1	1	3	2
IDD 712	Special Project on Field Survey in Textiles Design	0	0	9		3
IDD 736	Fashion History And Production	1	0	3		3
IDD 738	Printed and Dyed Textiles	1	0	3		2
	TOTAL		7	3	24	16

Third Semester: Courses in this semester are compulsory for all students in their various options

Course Code	Course Title	L	T	P	U
IDD 743	Project Critic Development	0	0	9	3
IDD 745	Seminar in Studio Practices	0	0	9	3
IDD 799	Practical Project in Ceramics, Graphics and Textiles Options	0	0	18	6
	TOTAL		**0**	**0** 36	12

Note: Total units to be completed by Postgraduate Diploma students as requirement for graduation in Textiles Section 44

COURSE SYNOPSES (PGD)

IDD 701: Industrial Design Organizations and Management (2 Units)

Encompasses the processes, business decisions, and strategies that enable innovation and create effectively-designed products, services, communications, environments, and brands. How do these factors enhance quality of life from Industrial Design approach (Solving and find desirable solutions for complex problems, drawing upon logic, imagination, intuition, and systemic reasoning, to explore possibilities of what could be done to create desired outcomes that benefit the end users). Organization and management strategies that encourages development oflocal professionals. Overview Federal decree enacted to strengthen the institution of professional bodies, organizations, societies and associations and also strengthen the process of certification (with Corporate Affairs Commission): their roles in advancement of professions; membership rights and their functions.

IDD 702: Ceramic History (2 Units)

History of materials, equipments and production methods in pottery and ceramic technology. High-level conceptualization of problems and solutions in ceramics. Ceramics styles and trend in industrial developments in

Nigeria.

IDD 703: General Drawing

(1) Drawing From Objects

Students are expected to select various objects for rendition in their sketch pads and course assignments as guided by lecturers. Angular objects with shapes of different dimension and sizes are expected in the course work.

These include:

- Junk items
- Broken furnitures
- Dilapidated buildings
- Accident vehicles and
- Concrete irons

Drawing From Posed Models

Models are expected to be studied, observed and rendered in different drawing media. Usage and ownership of sketch pads are essential.

IDD 704: Industrial/Ceramic Studio (2 Units)

Studio exercises in creative thrown pottery for decoration and utility. Exploration of body decoration in various methods such as spraying and engob-decoration.Production of functional and cost-effective proto-types for industrial production.

IDD 705: History and Philosophy of Industrial Design (2 Units)

Students will be exposed to the works of design/artists through the ages. How design have been influenced by earlier artists, past styles and the characteristics of past eras, designers and visual communicators. The course will examine design history for inspiration and the significant eras in design history as well as Visual Language of Design. The activities of design movements of 20th Century such as the Arts and Crafts Movement; Art Nouveau; Dadaism; Modernism; Futurism; Bauhaus; Art Deco; and Post Modern Design. The design principles of the various movements and their influence of product design will be discussed.

IDD 706: Studies of Glaze and Enamel (2 Units)

Acquisition of knowledge and skills in glaze compounding and glaze process for both studio and industrial works.

IDD 707: Research Methods (2 Units)

This course will provide an opportunity for students to establish or advance their understanding of research through critical exploration of research language, ethics, and approaches. The course introduces the language of research, ethical principles and challenges, and the elements of the research process within quantitative, and mixed methods approaches. Students will use these theoretical underpinnings to critically review literature relevant to their field or interests and determine how research findings are useful in informing the understanding of their environment (work, social, local, global). Specifically students will: understand research terminologies, aware of the ethical principles of research, ethical challenges and approval processes; Describe quantitative, qualitative and mixed methods approaches to research; Identify the components of a literature review process; Critically analyze and report published research.

IDD 708: Kiln/Furnaces (2 Units)

Kiln architecture and principles. Kiln construction and maintenance. Kiln repairs and maintenance. Kiln firing.

IDD 709: Interior Design And Decoration

Part one of the course shall explore the historical content of traditional and modern interior decorations in Africa and beyond. A term paper is expected to be submitted by individual student as a fulfillment for the completion of the course. The key actors and master designers in interior decoration profession shall be appraised vis- -vis their contributions to the world of Interior Design and Decoration.

Part two of the programme would require the students to choose specific items of interior decoration unique to their specialization and the profession for production. The prototype presentation in any aspect of interior decoration shall attract marks that are commensurable to each object.

IDD 710: Advanced Design Studio (3 Units)

Exposure to design process in the ceramic studio environment from conceptualization to implementation.

IDD 712: Projects (6 Units)

Execution of special project in Ceramics, Graphics and Textiles Design that requires topic expression of field experience that is demonstrated on special studio project with advanced skills. Studio projects must be completed by written reports and exhibition.

IDD 722: Textile Design Management

Introduction to feasibility studies of small and medium scale textile industries. Production planning and economic use of resources. Textile merchandising and marketing. Application of technology to textile design. Understand the importance of professionalism, effective communication and critical reasoning in the textile industry.

IDD 724: Computer Application In Textile Design

Application of principles of elementary digital design skills using Corel Draw/Adobe photo shop/Adobe Illustration. Translation of design ideas into computer rendering, presentation and production of textile prototypes. Creative use of software to produce quality textile design repeats for reproduction purposes.

IDD 726: Textile Design Studio

Students are to study the principles of design and colour, concept of structure and space in two-dimensional (2D) project. Creative use of elements and principles of design to produce surface design for wearable and furnishing fabrics. Development of motifs and use of repeat techniques for textile design.

IDD 728: Fibre Technology

Definition of fibre technology, classification and uses of fibres, production of synthetic fibres and yarn production. Physical and chemical properties of fibre. Fibre finishing and basic fabric construction.

IDD 736: Fashion History And Production

An introduction course in the History of Fashion Evolution, highlighting styles of specific time periods in History. Discussion on various trends and styles in voque. Students are to study design for men, women and children. Importance of fashion accessories and embellishment. Future prospects of fashion industry in Nigeria. Basic pattern drafting and translation into garments.

b) MASTER OF TECHNOLOGY (M-TECH) INDUSTRIAL DESIGN

COURSE OUTLINE

First Semester (General Core Courses)

Course Code	Course Title	L	T	P	U
IDD 801	Survey Seminar on Concept and Philosophy of Industrial Design (Art theory & practices)	3	0	0	3
IDD 803	General Drawing (Practical)	0	0	3	3
	Total		**3**		**3** **6**

Ceramics Option (1st Semester)

Course Code	Course Title	L	T	P	U
IDD 811	Advanced Ceramics Workshop Practice (Throwing and Hand Building)	0	0	3	3
IDD 813	Methods and Materials in Ceramics (Utility Studies and Mass Production Techniques) - Materials Science	3	0	0	3

Electives (at least minimum of 3 credits units per Semester)

Course Code	Course Title	L		T	P	U
IDD 821	Computer Graphics appreciation (Package Design, Promotional Design and Advertising	2	0	1	3	
	Total		**5**	**0**	**4**	**9**

Graphics Option (1st Semester)

Course Code	Course Title		L	T	P	U
IDD 821	Computer Graphics appreciation (Package Design, Promotional Design and Advertising	2	0	1	3	
IDD 823	Creative Photography (Methods and Materials)	2	0	1	3	
	Electives		0	0	0	3
	TOTAL		**4**	**0**	**2**	**9**

Electives (at least minimum of 3 credits units per Semester)

Course Code	Course Title	L	T	P	U
IDD 831	Textile Dyeing and Dyestuff	3	-	-	3

Textiles Option (1st Semester)

Course Code	Course Title	L	T	P	U
IDD 831	Textile Dyeing and Dyestuff	3	0	0	3
IDD 833	Methods and Materials Studies in Textile Technology	3	0	0	3

Electives (at least minimum of 3 credit units per Semester)

Course Code	Course Title	L	T	P	U
IDD 821	Computer Graphics appreciation (Package Design, Promotional Design and Advertising	2	-	1	3
	Total	**8**		**-** **1**	**9**

CORE COURSES

General Courses For 2nd Semester

Course Code	Course Title	L	T	P	U
IDD 802	Research Method	3	0	0	3
IDD 804	Thesis/Research Proposal	3	0	0	3
	Total		**6**	**0** **0**	**6**

Ceramics Option (2nd Semester)

Course Code	Course Title	L	T	P	U
IDD 810	Survey Seminar on Pottery through the Ages	3	0	0	3
IDD 812	Firing, Glazing and Glazes	0	0	3	3
IDD 814	Prototype Design for Ceramic Industry (Kiln Construction and Development)	1	0	0	3

Electives (at least minimum of 3 credit units per Semester)

Course Code	Course Title		L	T	P	U
IDD 832	Advanced Textile Design and Printing	3	-	-	3	
IDD 834	Design in Textile Industry	3	0	0	3	
	TOTAL		**6**	**0**	**0**	**6**

Graphics Option (2nd Semester)

Course Code	Course Title	L	T	P	U
IDD 812	Firing, Glazing and Glazes	0	0	**3**	**3**
IDD 832	Advanced Textile Design and Printing	3	0	0	**3**
	Total	**8**	0	**7**	**15**

Textiles Option (2nd Semester)

Course Code	Course Title	L	T	P	U
IDD 834	Textile Design Industry	3	0	-	3
IDD 832	Advanced Textile Design and Printing	3	0	-	3
IDD 830	Survey Seminar on Weaving Loom Construction and Development	3	0	-	3

ELECTIVE (at least minimum of 3 credit units per Semester)

Course Code	Course Title L T P				Units
IDD 812	Firing Glazing And Glazes	2	0	1	3
IDD 824	Advanced Printmaking Woodcut and Etching (Metal and Plastic Etching and Design	0	0	3	3
	Total	**8**		**0**	**1** **15**

Third Semester

Project for all M.Tech Students, (Ceramics, Graphics & Textiles)

Course Code	Course Title	L	T	P	U
IDD 899	Master's Thesis Research Project	0	-	-	12

COURSE SYNOPSES (M.TECH)

Ceramics Option

IDD 801: Concept and Philosophy of Industrial Design

This course will examine the origin and evolution of material culture in man from paleothic age to the 20th century. The main contents being the early man and tools improvisation, evolution of pottery and weaving. The development of building materials and construction through the ages, 18th century Industrial Design in the modern era. Various components of Industrial Design will be examined through team work.

IDD 802: Research Methodology

This includes general theoretical concepts of conducting scientific research as well as formal and logical methods of writing. Use of library and reviewing literature will be examined. Methods of conducting pilot study and preparing a formal thesis proposal will be discussed.

IDD 803: General Drawing

An experimental drawing activity of practical exploration will be examined. The emphasis is on the development and advancement of technical manipulative skills and Graphics Communication of perceived objects – with mastery of media firm structural rendition and composition.

IDD 804: Proposal Seminar – Thesis

IDD 810: Pottery Through The Ages

Origin of Pottery.Traditional Ceramics in Africa. Oriental Ceramics, 18th century. Ceramic in Europe and Industrial Revolution. This course provides the opportunity of acquiring the knowledge of historical development of ceramic production through the ages.

IDD 811: Advanced Ceramics Workshop Practice

Throwing of large vases. Hand building of vases. Ceramic sculpture. Architectural ceramics: Production of floor and tiles and mosaic tiles. Production of sanitary wares.

IDD 812: Advanced Industrial Ceramics

Production of moulds and casting; preparation of plaster of – Paris ($CaSO_4 \quad H_2O$) from the mineral gypsum ($CaSO_4 2H_2O$).The making of positive and negative moulds. Formation of casting slip: the mechanism of slip formation. The basic factors governing plasticity. Advanced methods of shaping in the plastic (solid) state:

a. Jiggering and jollying
b. Forming by roller machines
c. Plastic pressing or "Ram Pressing"
d. Impact forming
e. Injection moulding

IDD 813: Materials Studies In Ceramic

Study of raw materials for ceramic production (6 weeks):

- Clays
- Ceramic oxides (silica,Alumina, feldspars, etc.)
- Colouring oxides; antimony oxide colbalt, copper, iron oxides, tin oxide, manganese oxide, rutile.

Study of types and locations of ceramic materials available in Nigeria (3 weeks). Exploration (visit to the location) of ceramic raw materials available within the student's vicinity (collection of two to five samples of ceramic materials will be sufficient). (3 weeks independent study).

IDD 814: Advanced Studies in Ceramic Glazes

Formation of: Earth ware glazes, Stoneware glazes

- Porcelain glazes -
  Ash glazes
- Salt glazes
- Methods of glaze application
- Glaze aspects.

IDD 815: Ceramics Management and Marketing, Study into Equipment for Pottery Production

Understanding a mechanism of ceramic equipment such as throwing wheels, kilns, ball mill, pug mill, crushers, plungers, spraying machine.

- Feasibility study for establishing ceramic industry
- Exploration into ceramic industries available in students vicinity

Graphics Option

IDD 820: Film, Animation And Television Technology

Theory and practice of film, filming design structures and criteria.Experiments in film animation, television production in Graphics and text formatting in Television. The role of hand written letterings and computer made fonts in computer graphics, colour consideration on TV screen. Cartons and animation presentation.

IDD 821: Computer Graphics

Adequate knowledge of Computer Aided Design (CAD)

especially in areas of Corel Draws and Design packages. Extraction and adoption of materials for use in computer.Studies in Internet formation and illustration of poster designs, handbills and general advertisement. Adaptation of the CAD experiences for textile designers who chose the course as electives.

IDD 822: Printing Technology

General appreciation, theory and practice of printing machine operation, book packaging and finishing, text studies and readership culture.

IDD 823: Creative Photography

The study of methods and materials in photography. The use of photography as a graphic communication medium. The theories and practices of artistic creation and expression in photography. Photography as an aspect of visual design and art of documentation. The study of new trends and developments in camera production and manipulation. The camera as a modern equipment for artistic creative developments.

IDD 824: Advanced Printmaking

The course will explore various methods of printmaking such as advanced lithography, advanced intaglio methods, advanced serigraphy and advanced relief methods. Etching wood cut and metal plastic design. Student should select, at least one of the options and experiment with the character of the medium and the techniques in a way that the result can enhance his creativity and technical proficiency.

Textiles Design Option

IDD 830: Survey Seminar on Weaving, Loom Construction and Development

This course aims at preparing students for challenges in traditional and modern weaving technologies. The study of the theoretical framework of weaving culture in Nigeria/Regional/ Ethnic/Cultural levels and the world at large will bring into focus some aspects of production existing in the craft. The study of looms and construction methods of varieties will provide dynamic ideas for the development of new types and accessories. Extensive literature search of the weaving culture and the industry is required.

IDD 831: Textile Dyeing And Dyestuffs

Textile dyeing methods and the study of the use of dyestuffs in many part of the world. Practical and studio requirements of varieties of experimentation in dyeing and the ability of the students to use varieties of dyestuffs on variant fibres and fabrics. Designing will go along with the Dyeing. Extensive study and practice with different grades and brands of synthetic and cotton dyes, industrial dyes and the application of mordant and other chemicals.

IDD 832: Advanced Textile Design And Printing

Lectures will explore varieties of textile paper designs and simulations for fabric printing projects. Independent studies in colourations, decorations and embellishments of fabrics of various grades and textures. Advanced printing table practice and presentation of printed simulations for use in Textile industries. Blackout and Design transfer methods will be revisited and highlighted. Motifs formation and creation will complement the modern method of design transfer through computer to the exposure in darkroom, using photographic method.

IDD 833: Methods And Materials Study In Textile Technology

This course is an investigation into local sources and manufactures of dyes wax as a medium of textile decoration and other useful materials in textile production. Emphasis will be laid on how students can create, re-create or improve textile working tools and materials for effective production in studios and cottage industries. Design of prototypes of simple textile equipments that can assist fabric decoration will be encouraged.

IDD 834: Design In Textile Industry

Lectures in the course will focus on the working conditions in the Textile Industries. The combined functions of various departments in the Industry will be emphasized. Managerial structures and Industrial Relations will be focused. Merchandize and product advertisement structures will be under this study. Reports and progress of textile industry will be measured by the level of student's interactions with various segments of the textile industry.

IDD 899: Master's Thesis Research Project 12

C)Doctor of Philosophy (Ph.D) Industrial Design

IDD 999: Doctoral Research Project

The degree of the Doctor of Philosophy in Industrial Design of the Federal University of Technology, Akure is principally by research. However, where candidates' Transcripts for Master's Degree show deficiency in relevant courses that are needed to improve the quality of work required for graduation in the Doctor of Philosophy in Industrial Design, such candidates shall be made to take audited courses at Masters level when admitted. Such audited courses should be offered and passed by the candidates before the commencement of their research topics for the Doctoral programme. Students' supervisors working in conjunction with the Postgraduate Committee of the Department should agree on the rectification of such deficiencies in relevant courses. However, the discretion of the supervisors is paramount in this process.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF INDUSTRIAL DESIGN

S/N	NAME	QUALIFICATIONS	STATUS	SPECIALISATION
1	Prof. O. F. Kayode	NCE, B. A. (Zaria) M.Tech, Ph.D (Akure)	Professor	Printing Technology, Digital Advertising and Entrepreneurship Education
2	Prof. T. L. Akinbogun	B.A (Benin), M.A (Zaria), Ph.D (Akure)	Professor	Ceramic Management, Kiln Design/Firing/Refractory
3	Prof. I. B. Kashim	B.A., M. A. (Zaria), Ph.D (Akure)	Professor	Industrial Raw Materials and Processing; Clay Exploration for Technological Solutions
4	Prof. E. B. Oladumiye	NCE, B.A (Benin), M.Tech, Ph.D (Akure)	Professor	Print making, Design, Etching, Illustration, Layout and Advertising
5	Prof. O.A. Fatuyi	B.A. (Zaria), M.F.A. (Benin), Ph.D (Ogbomoso)	Professor	Ceramics and Glass
6	Prof. B. E. Adiji	B. A. (Zaria), M.Tech., Ph.D (Akure)	Professor	Textile Studio Designing
7	Dr. T. I. Ibiwoye	B. Tech. (Bauchi), M.Tech, Ph.D (Akure)	Professor	Photography, Multimedia Graphics and Social Photography and Design
8	Prof. E. L. Etsename	NCE, (Pankshin) B.A (Zaria), MFA, (Benin), M.Tech. (Akure), Mres, Ph.D. (Lincoln)	Professor	Multimedia graphics Design for Social Innovation, Photography and Printing.
9	Dr. O.O. Fadairo	B.Tech (Akure); PhD. (Akure)	Senior Lecturer	Industrial Ceramics
10	Dr. O. S. Adelabu	B.Tech., M.Tech (Akure), Ph.D. (Tsukuba)	Senior Lecturer	Ceramic Design, 4IR Technologies and Applications in Ceramics Production Processes, Product Design, Science of Design
11	Dr. A. O. Ajala	B.Tech., M.Tech, (Bauchi), Ph.D. (Akure)	Senior Lecturer	Ceramic Material Science & Technology; Industrial Design
12	Dr. T. P. Ologunwa	B.Tech., M.Tech. (Akure) Ph.D. (Akure)	Senior Lecturer	Industrial Ceramics, Ceramic Materials and Processing
13	Dr. O.B. Emidun	B.Tech., M.Tech. (Akure) Ph.D. (Akure)	Senior Lecturer	Textile Design and Entrepreneurship
14	Dr. (Mrs.) E. A. Erhuanga	B.Tech., M.Tech, (Akure), Ph.D (Akure)	Lecturer I	Ceramics, Industrial Design, product Development, Ceramic-based water treatment, technologies

9.6.5 DEPARTMENT QUANTITY SURVEYING (QSV)

1. AVAILABLE OPTIONS/ SPECIALIZATIONS

a. Postgraduate Diploma (PGD) with specialization in:
   (i) Quantity Surveying
   (ii) Construction Management

b. Master of Technology (M. Tech) with specialization in:
   (i) Quantity Surveying
   (ii) Construction Management

c. Doctor of Philosophy (Ph. D) with specialization in:
   (i) Quantity Surveying
   (ii) Construction Management

2 PHILOSOPHYAND OBJECTIVES

a. Postgraduate Diploma (PGD) programme**s**

(i) Quantity Surveying

The discipline of Quantity Surveying like any other discipline in the field of Environmental studies is never static and its dynamic nature demands a continous update of what can be referred to as the body of Quantity Surveying knowledge. The philosophy of this postgraduate programme is to create an enabling climate of interaction between those candidates who have acquired professional experience with limited academic exposure and those graduates in Quantity Surveying and cognate disciplines who may not have gone through the rigors of practical experience. This it is envisaged will produce a blend of Quantity Surveyors who will function effectively as cost advisers and financial managers in the various requirements of the construction industry such as building, civil and engineering projects. To this end, the objectives of the programme are to:

(i) Provide an opportunity for advanced knowledge in Quantity Surveying for those in practise without going through formal postgraduate degrees.

(ii) Help those who may wish to make up their deficiencies in their first degrees especially to be able to pursue higher degree programmes.

(iii) Bridge the gap between the Higher National Diploma and first degree in Quantity Surveying in order to allow the former to pursue higher degree programmes and also qualify them for registration with the Quantity Surveyors Registration Board of Nigeria (QSRBN).

(ii) Construction Management

The need to produce a pool of well-seasoned professionals for effective management of the construction industry in order to improve its performance and make significant contributions to the Nigerian economy cannot be over-emphasized. Various professionals are involved in the delivery of construction projects from conception to completion and anyone of these professionals may be appointed to the positions of project/ construction manager as may be deemed fit by the employer especially as is the practice in the industry in Nigeria. In view of this, all these various professionals need a continous update and development of their knowledge of management practices and new innovations in the industry in order to be able to face these challenges.

The philosophy of the programme therefore is to improve the knowledge of construction professionals in the management of all forms of infrastructural developments. The objectives of the programme are to:

(i) Help those who may wish to make up their deficiences in their first degrees especially to be able to pursue a higher degree programme in construction management.

(ii) Bridge the gap between the Higher National Diploma and first degree in construction related disciplines in order to allow the former to pursue a higher degree programme in construction management.

(iii) Produce a crop of well seasoned construction managers that can function effectively well for speedy delivery of construction projects.

b. Masters of Technology (M. Tech) / Doctor of Philosophy (PhD) programmes

Quantity Surveying and Construction Management provide a comprehensive cost and managerial control of all activities in the construction sector of any nation's economy. There is therefore the need to continue to train professionals in these areas to meet these challenges of a growing industry. The construction management option is to equip professionals working in the construction industry to play an effective role in managing construction activities at both the design and construction stages.

The specific objectives of the programmes are to:

(i) Provide advanced academic courses for students who want to undertake further studies and research in Quantity Surveying/ Construction Management.

(ii) Develop a more comprehensive bodyof knowledge for higher degree programmes in Quantity Surveying through research which the profession has been lacking over the years.

(iii) Meet the manpower requirements for teaching and research especially in Quantity Surveying.

(iv) Establish research areas which will lead to the improvement of design, management and maintenance methods for construction projects.

ADMISSION REQUIREMENTS

a. Postgraduate Diploma (PGD) programmes

Candidates for admission to the programme should possess any of the following qualifications:

Quantity Surveying

(i) B. Tech in Quantity Surveying/ Building or its equivalent.

(ii) HND at credit level in Quantity Surveying/ Building or its equivalent from a recognized Polytechnic or Colllege of Technology.

Construction Management

(i) B. Tech in any of Quantity Surveying, Building, Architecture, Estate Management and Civil Engineering or its equivalent.

(ii) Higher National Diploma (HND) at Credit level in any of Quantity Surveying, Building, Architecture, Estate Management and Civil Engineering or its equivalent from a recognized Polytechnic or College of Technology.

(iii) Corporate members of the Nigerian Institute of Quantity Surveyors (MNIQS) and Nigerian Institute of Building (MNIOB) with cognate experience of not less than 3 years in the construction industry.

b. Masters of Technology (M. Tech)

Candidates must possess any of the following qualifications in addition to satisfying the general University regulation for admission:

Quantity Surveying

(i) B. Tech in Quantiy Surveying/ Construction Economics with at least Second class Honours of the Federal University of Technology,Akure or its equivalent

(ii) PGD in Quantity Surveying of the Federal University of Technology, Akure or its equivalent with a minimum overall CGPA of 3.50

Construction Management

(i) B. Tech in Quantity Surveying/ Building/ Architecture/ Estate Management/ Civil Engineering with at least Second Class Honours of the Federal University of Technology,Akure or its equivalent.

(ii) PGD in Quantity Surveying/ Building/ Construction Management with a minimum of Upper credit of the Federal University of Technology, Akure or equivalent with a minimum overall CGPA of 3.50.

c. Doctor of Philosophy (Ph.D) programme

Quantity Surveying

Candidates must have M.Tech degre in Quantity Surveying/ Construction economics of the Federal University of Technology, Akure or its equivalent with a minimum overall CGPA of 3.50. The candidate may also be required to have scored not less than 60% in the oral thesis examination.

Construction Management

Candidates must have M. Tech degree in Construction Management, Quantity Surveying or Construction Economics of the Federal University of Technology, Akure or its equivalent with a minimum of overall CGPA of 3.50. The candidate may also be required to have scored not less than 60% in the oral thesis examination.

DURATION OF PROGRAMMES

a. Postgraduate Diploma (PGD) programmes

The programme will be a minimum of three (3) academic semesters on full time basis.

b. Masters of Technolgy (M. Tech) programmes

Full Time: minimum of 18 months and maximum of 24 months

c. Doctor of Philosophy (PhD) programmes

Full Time: minimum of 36 months and maximum of 48 months

Part Time: minimum of 48 months and maximum of 60 months

Upon application, Senate may approve an extension where necessary.

REQUIREMENTS FOR GRADUATION

a. Postgraduate Diploma (PGD) Programmes

Candidates must complete a total of 37 units and 34 units of course work for Quantity Surveying and Construction Management respectively and 6 units of Research work. The research work must show an original contribution of the researcher to knowledge.

b. Master of Technology (M. Tech) Programmes

Candidates must complete a total of 33 units of course work and 12 units of research work. The research work must show an original contribution of the researcher to knowledge.

c. Doctor of Philosophy (PhD) Programmes

All candidates are expected to carry out original research projects supervised by approved postgraduate Lecturers and successfully defend same in accordance with the Postgraduate school. The Ph.D degree is awarded mainly in the recognition of the candidate's high scholarly ability in his area of research. The product of the research must form a definite contribution to knowledge.

POSTGRADUATE PROGRAMME

a. Postgraduate Diploma (PGD) Programmes

Quantity Surveying

First Semester

Course Code

	Course Title	L	T	P	U
QSV 701	Advanced Building Measurement and Specialization	3	0	0	3
QSV 703	Construction Technology and Services	2	0	3	3
QSV 705	Development Economics	2	0	0	2

QSV 707	Operations Research in Construction	2	0	0	2
QSV 709	Construction Tendering and Estimating	2	0	0	2
QSV 711	Contract Law and Administration	2	0	0	2
QSV 713	Research Methodology and Seminar Proposal	0	0	6	2
	Total				16

QSV 711	Contract Law and Administration	2	0	0	2
QSV 713	Research Methodology and Seminar Proposal	1	0	3	2
QSV 723	Introduction to Construction Management	2	1	0	3
QSV 725	Construction Codes and Regulations	2	0	0	2
	Total				16

Second Semester

Course Code	Course Title	L	T	P	U
QSV 702	Measurement of Electrical and Mechanical services	3	0	0	3
QSV 704	Construction Technology and Materials	2	0	3	3
QSV 706	Construction Management and procedures	2	0	0	2
QSV 708	Project Management	2	0	0	2
QSV 710	Cost Control	2	0	0	2
	Total				12

Second Semester

Course Code	Course Title	L	T	P	U
QSV 704	Construction Technology and Materials	2	0	3	3
QSV 708	Project Management	2	0	0	2
QSV 712	Construction Scheduling	2	1	0	3
QSV 714	Budgeting and Financial Control	2	0	0	2
QSV 716	Human Resources Management in Construction	2	0	0	2
	Total				12

Third Semester

Course Code	Course Title	L	T	P	U
QSV 799	PGD Research Project	0	0	9	6

Third Semester

Course Code	Course Title	L	T	P	U
QSV 721	Information Technology in Construction	1	0	3	2
QSV 727	Construction Plants and Equipment	2	0	0	2
QSV 729	Maintenance Technology and Management	1	0	3	2
QSV 731	Quality Control in Construction	2	0	0	2
	Total				8

Construction Management

First Semester

Course Code	Course Title	L	T	P	U
QSV 703	Construction Technology and Services	2	0	3	3
QSV 707	Operations Research in construction	2	0	0	2
QSV 709	Construction Tendering and Estimating	2	0	0	2

Course Code	Course Title	L	T	P	U
QSV 799	PGD Research Project	0	0	9	6

Master of Technology (M. Tech) programmes Quantity Surveying

First Semester

Course Code	Course Title	L	T	P	U
QSV 801	Measurement and Costing of Construction works	3	0	0	3
QSV 803	Advanced Cost Control	3	0	0	3
QSV 805	Applied Research methods	3	0	0	3
QSV 807	Value management	3	0	0	3
Electives (6 Units of Electives)					
QSV 809	Project Psychology	3	0	0	3
QSV 811	Strategic Construction Procurement	3	0	0	3
QSV 825	International Management Issues in Construction	3	0	0	3
	Total				18

Second Semester

Course Code	Course Title	L	T	P	U
QSV 802	Construction estimating and logistics	3	0	0	3
QSV 804	Applied Contract Law and Administration	3	0	0	3
QSV 806	Project Risk management	3	0	0	3
QSV 820	Advance Project Management	3	0	0	3
Electives (3 Units of Electives)					
QSV 808	Operation Research Applications	3	0	0	3
QSV 822	Financial Management in Construction	3	0	0	3
QSV 824	Project Performance Measurement	3	0	0	3
	Total				15

Course Code	Course Title	L	T	P	U
QSV 899	PGD Research Project	0	0	18	12

Construction Management

First Semester

Course Code	Course Title	L	T	P	U
QSV 805	Applied Research methods	3	0	0	3
QSV 821	Advanced Management studies	3	0	0	3
QSV 823	Management of Design & Construction	3	0	0	3
QSV 825	International Management Issues in Construction	3	0	0	3
Electives (6 Units of Electives)					
QSV 809	Project Psychology	3	0	0	3
QSV 827	Organisation Change	3	0	0	3
QSV 829	Management of Construction Materials and Plants	3	0	0	3
	Total				18

Second Semester

Course Code	Course Title	L	T	P	U
QSV 804	Applied Contract Law and Administration	3	0	0	3
QSV 820	Advance Project Management	3	0	0	3
QSV 822	Financial Management in Construction	3	0	0	3
QSV 824	Project Performance Measurement	3	0	0	3
	Electives (3 Units of Electives)				
QSV 808	Operation Research Applications	3	0	0	3
QSV 826	Human Resources Management	3	0	0	3
QSV 828	Planning and Operation of Production System	3	0	0	3
	Total				15

Course Code	Course Title	L		T	P	U
QSV 899	PGD Research Project	0	0	18		12

Doctor of Philosophy (Ph.D) Programmes

Course Code	Course Title	L		T	P	U
QSV 999	PhD Research Project	-	-	-		-

COURSE SYNOPSES

A. POSTGRADUATE DIPLOMA (PGD) PROGRAMMES

QSV 701 Advanced Building Measurement & Specification 3 Units

A general overview of the measurement of building works. Measurement of building elements using complex drawings such as high-rise buildings, External works, Structural steel works, Building specification.

QSV 702 Measurement of Mechanical & Electrical Services 3 Units

Measurement of Plumbing Installation, Drainage works, heating installations, gas installation, Compression air installation, fire fighting, mechanical movement systems and other associated builder's works. Electrical installation. Ventilation and air-conditioning, Communication and Security Systems, Refuse disposal installations.

QSV 703 Construction Technology & Services 3 Units

Site preparation- Dewatering and soil stabilization, Anchorage, Heavy foundations- Raft, grillages, pilling systems, Basement, Underpinning, retaining and diaphragm walls, Floors and Roofs for complex structures. Production and fabrication of steelwork. Precast and prestressed construction. Industrialized system building. Electrical Installation, ventilation and air conditioning, mechanical movement systems. Fire protection.

QSV 704 Construction Technology and Materials 3 Units

Civil engineering construction- Road pavement, bridge, dams, harbour works, Rail track, Airport, Tunnelling, Sewage treatment intallatione.t.c. Communication system, structural timber, concrete technology, innovation in construction materials and use of local materials.

QSV 705 Development Economics 2 Units

Aims of public and private developers. Factors influencing the development process. Budgeting for private and public development. Choice and acquisition of sites and their effects on development. Feasibility studies- Developer's budget. Source of fund for development, public investement, mortgage financing, cash flow forecasting. Development bonds, loans grants, subsidy and taxation.

QSV 706 Construction Management and Procedure 2 Units

Management ideas/ thoughts. Decision making process including the use of committee system. Organisation and Accountability. Office automation. Analogue and digital computing. Personnel administration communication. Production planning and program- Bar chart, CPM etc. site management procedure, work and productivity studies. Working capital and flow of fund in the construction industry. Building materials management. Plant management.

QSV 707 Operations Research in Construction 2 Units

Linear programming, Transportation and assignment problems, programming and scheduling. Queuing theory, inventory control, Simulation models etc.

QSV 708 Project Management 2 Units

Financial Managegent-Banking System, Stock Exchange, Construction Finances, Insurance Industry and how they relate to construction. Management, Servicing and repayment of loans, methods of loans renegotiations and rescheduling. Contract procurement system vis- -vis the project management option. Introduction to Project Management Consultancy. Qualifications, functions and responsibilities of the Project Manager. Funding and the project manager, marketing and public relations function and policies. Quantity Surveying and Project Management practice. Project management and prime consultancy compare. Evaluation of project management consultancy in Nigeria.

QSV709 Construction Tendering and Estimating 2 Units

A critical review of the Estimating & Tendering processes. Computation of unit rates for complex building and civil engineering works. Preparation of sub-contractor's quotations-mechanical and electrical works, material manufacturing firms. Preparation of schedule of materials, labour and plant items.

QSV 710 Cost Control 2 Units

Cost implication of design variables and construction methods- a critical view. Modern estimating techniques, cost planning techniques and their practical application to typical projects. Cost-in-use studies. Investment Appraisal. Feasibility studies. Cost Benefit Analysis. Value engineering. Cost modelling.

QSV 711 Contract Law and Administration 2 Units

A general overview of the principles of the law of contract, tort, property and land laws. Formation and execution of building, civil and other engineering contracts including the interpretations of the current conditions of contract in use (JCT 1980, SFBCN 1990 etc). Discrepancies between building and civil engineering contracts in terms of their conditions. FIDIC conditions. Arbitration and awards- principles, practice and interoperation of arbitration Decree NO. of 1988.

QSV 712 Construction Scheduling 3 Units

Definition of scheduling : aims and advantages. The planning Techniques: Concept of planning, purpose of planning, types of planning technique, specific uses and features e.g. Bar chart, Critical Path Methods (CPM), Line of balance, Horse Blanket etc. emphasis on control tools e.g maintenance schedule, labour schedule, equipment schedule, site layout, management of subcontractors/supplying, BOQ and the budget statement. Productivity studies in the construction industry, meaning of productivity, factors affecting productivity, measurement of productivity, work study, work measurement, method study, activity study, foreman delay survey,incentives, motivation.

QSV 713 Research Methodology and seminar proposal 2 Units

The course introduces student to the skills necessary to conduct vigorous and original research and effectively communicate their research findings in a clear and systematic manner. Research and the tools of research- meaning of research, type of research, tools for research. Research planning and design, planning, review of literature, nature of data/research methodology, research proposal. Research methodology. Presentation of research results. The students are expected to present two separate seminars on topical issues which may relate to their proposed research project.

QSV 714 Budgeting and Financial Control2 Units

Introduction to business organisation, financing modern business, accounting theory, cost accounting, purpose of accounting, time-value of money in financial decisions, use of profit information, working capital management, financial analysis and planning, cash flow forecasting, sources of capital, Developer's budgeting.

QSV715 Measurement of Civil Engineering Works 3 Units

Inroduction of Civil Engineering measurement. The use of detailed drawings for the measurement of earthworks, retaining walls, piling systems, roads, bridges, air field, railway track, tunnels, harbor works, dams etc. Civil Engineering specification.

QSV 716 Human Resources Management in construction 2 Units

Classification of construction workers into; manual workers, technicians, management ways of satisfying the training needs of the groups, consideration of welfare package, productivity and industrial relations of construction workers, recruitment procedures in the construction industry, job description and training, instructions for personnel, manpower development for personnel

QSV 717 Heavy Engineering 3 Units

Units scope of heavy engineering- definition, principle and constituent of heavy engineering i.e. equipments, facilities, structures and raw materials for pharmaceutical chemicals, nuclear energy, gas exploration and production, oil exploration, production and refinery, power generation, food and drinks, paper milling, steel and non-ferrous metal production, telecommunicating, etc. procurement of engineering contracts- technological licensing and patent. Turnkey procurement method. Bidding procedures. Financing of engineering contracts-feasibility studies, letter of credit, suppliers credit, contractor financing. Measurement and control of engineering project-construction site services, scaffolding, steelworks, plants, ductwork, pipework, electrical work, instrumentation, insulation, protective covering , sundry items.

QSV 719 Quantity Surveying Practice & Procedure 3 Units

Roles and responsibilities of participants to Building and Civil Engineering contracts especially the relationships between the Quantity Surveyor and others. Scope of Quantity Surveying functions from inception to completion of projects Valuation and Final Accounts procedures. Principles of professional conducts and misconducts. Conditions of engagement of the QS. Involvement of QS in different contract procurement methods. Principles of fee calculation. The future and development of Quality Surveying

QSV721 Information Technology in Construction 2 Units

Introduction to various types of computer components on a computer. The application of the computer principles and introduction; Word processing, Data base, spread sheets, Graphics, Desktop publishing integrated packages, Estimating, Cost planning and modelling, Computer Aided Design, Quantity Surveying software, Current Developments in Micro-Computing-Current trends in hardware and software technologies.

QSV 723 Introduction to Construction Management 3 Units

Definition and concept of Management: management ideas/thoughts; Historical Development, Management Objectives; Policy Planning; Management Theory-Contribution of Fayol, Taylor, Gilbereth, etc. Organizational Structure, Span of control, Authority, Responsibility, Decision Making process including the use of Committee

system, Organization and Accountability, Office Automation, Parties in the construction industry, Construction Organization, Parties to Building Contract and their responsibilities.

QSV 725 Construction Codes and Regulation 2 Units

Building Regulation, Building Classification, Compartmentalisation, Fire resistance Requirements on Elemental part of Buildings and unprotected areas in external walls, Constructional Requirement for separation walls, Compartment walls and floors, protected chaffs, Fire resisting doors and doors assemblies, penetration of fire barriers, non- combustibility requirements for stairways in prescribed situations provision of cavity barriers and fire stopping. Control of flame spread on walls and ceilings. The sitting constraints on building and roof construction.

QSV 727 Construction Plants and Equipment 2 Units

Needs for mechanical plants in the construction process, types, Uses of Mechanical Plant e.g. Forklifts, Hoists, Excavators, Earthmoving Plants etc. Methods of Assessing Performance of Plants and Cost implications, Selection Criteria, Maintenance of Equipments, Problems of Indigenous Contractors in acquiring and using Construction Equipments. Advantages and Disadvantages of Purchase and Hiring of Equipments.

QSV729 Maintenance Technology and Management 2 Units

Definition, Types and Nature of Building Maintenance. Maintenance needs, Maintenance Operation Plan Causes, Effects and Remedies of Common Building Defects e.g. Cracks, Settlement, Condensation and Dampness. Underpinning, Principles and Methods, Maintenance System, Planning and Execution of Maintenance work, Building maintenance Policy Formulation, Schedule of Dilapidation and Conditions, Survey of Building Defects, Maintenace Profiles and Manuals, Maintenance Report Writing, Specification Writing, Budgeting for Maintenance.

QSV 731 Quality Control in Construction 2 Units

Definition of Quality and Quality Control, The need for Quality Control and specification writing, Elements of Quality, factors affecting Quality (from Human and Material perspectives), Control measures in Concrete, Blocks, Mortars, Ceiling, Roofs, etc, volume batching, weight batching, cement, sand, coarse aggregate ratio, Testing of materials (cement, sand, reinforcement rods, wood, concrete using rebound hammer, sampling, etc). Quality Control from tendering procedure through selecting of contractor, Quality Control from recruitment of workers and regular/ commitment supervision, Model for QualityAssurance.

QSV 799 PGD Research Project 6 Units

Students will be allowed to carry out research in a chosen area of Quantity Surveying/ Construction Management under the supervision of an academic staff. The result of the researchable topic should be creative and should be able to proffer solutions to practical problems in the construction industry.

B. MASTER OF TECHNOLOGY (M. TECH) PROGRAMMES

QSV801 Measurement and Costing of Construction Work 3 Units

General overview of systems of measurement and description, with a view to suggest improvements. Measurement of more complex foundation and underpinning. Measurement of complex steel works- Roof structure, frames etc. Measurement of air field construction, large sewer and drainage sewage treatment installations, power station, pump houses, dam and water and gas pipelines. Measurement of pipework, appliances, fittings and builder's work for heating, ventilation, air-conditioning systems, Fire fighting and hydraulic installations, compressed air and gas installations. Heavy and process engineering measurement- petrochemical, manufacturing processes and plant etc.

QSV802 Construction Estimating and Logistics 3 Units

Analytical estimating and application of work study programmes (this will involve practical studies aimed at improving the standard labour output used for estimating). Tendering and bidding theory, material cost control, variances, cost coding and game theory.

QSV 803 Advanced Cost Control 3 Units

Investigation of the briefing process and early design and cost advice for construction projects. Application of construction psychology to the briefing process. Feasibility studies. Critical study of contemporary evaluation techniques such as D.C.F., cost-benefit analysis, sensitivity analysis etc. Modern cost modelling techniques and application of computer. Improved cost planning techniques as a more valuable contribution to building design and construction process, Life cycle of Buildings.

QSV 804 Applied Contract Law and Administration 3 Units

A detailed and comparative knowledge of thr standard forms of Building and Civil Engineering contracts and related sub-contracts including their interpretation and application in Nigeria. Examination of typical contract documents in relation to key stages in project development. Case studies, cited and decided cases including analysis, interpretation and justifications. Contract conditions for emerging contract procurement methods such as design and build, project management etc. Legal aspect relevant to building maintenance.

QSV 805 Applied Research Methods 3 Units

Research in the Built Environment. Choosing a Research Topic-Availability of information, matching student and faculty interests, Special considerations. Research process- Finding a good problem, Designing the study, Sampling design, Resource allocation and Budgets, The proposal, Pilot testing, Data collection, Analysis and interpretation, Reporting research. The Research Proposal- The purpose, The contents. The Design of Research-Design strategies, Sampling Design, Measurement, Measurement scales. The Sources and Collection of Data- Secondary sources, Survey methods, Instruments for respondent communication, Observational studies, Experimentation, Analysis and Presentation of Data-Data preparation and description, Exploring, displaying and examining data, Hypothesis testing, Measures of Association, Multivariate analysis. Thesis Writing and Presentation in FUTA-The structure of a thesis, Writing styles, Thesis presentation, Criteria for judging thesis.

QSV 806 Project Risk Management 3 Units

General theories of risk and decision making. The nature of decision and the criteria upon which decisions are made. The nature of risk; including the relationship between risk and uncertainty, reward, value and premiums together with calculation. Approach to risk identification, evaluation, assessment, allocation & mangement. Approaches to decision making.Project procurement, funding and contractual division of project risk.Tools & techniques for decision-making and risk analysis.

QSV 807 Value Management 3 Units

An overview & background of value management, value management & value engineering. Global developments, Approaches to value management , Evaluation of importance of value to client, assessment of value criteria for specific projects- process of client briefing and qualify modeling, Techniques in use in the identification of function & prioritizing of requirements. Functional Analysis, Teams, team dynamics & facilitation, Toolbox, Case studies of previous projects. Practical application of value engineering to live projects.

QSV 808 Operations Research Application 3 Units

Problems solving case studies of complex construction activities using linear programming- Simplex methods, Transportation problem. Inventory Queuing theory and other quantitative methods. Simulation. Computer applications with specific reference to the construction industry. A critique of their uses and possible suggestions.

QSV 809 Project Psychology 3 Units

Evaluation of the interaction of people in the project environment, Nature of effective team work & the importance of appropriate leadership, project Environment vis- -vis communication, behaviour and dealing with the inevitable conflict. Industrial psychology as a science measurement of Intelligence, perception, Personalty, arousal etc. Development of skills. Occupational choices, motivation and job satisfaction. Recruitment and selection techniques. Case studies.

QSV 811 Strategic Construction Procurement 3 Units

Exploration of professional services procurement by client within the construction industry. History nature of the industry. Examination of the new procurement approaches being implemented within the construction industry, importance of working in partnership across organisations, professions and with the communities. Experience, potential & problems of inter – agency working in the public & private sectors. Empirical & theoretical knowledge of current issues of collaborative working. Analysis & evaluation of examples of collaborative working practice. Ethics and corporate social responsibility. Future issues in construction procurement.

QSV 820 Advanced Project Management 3 Units

An overview of contract procurement systems and the integration of project management. Definition and approach to construction project management. Conflict of professional roles and the integration of project management. Environmetal effects and project characteristics.Structure of clients and professional organization. Dispute and conflict resolution, leadership, team building & project closure, power and the project manager, Decision making and the project mangeres. Crashing in project planning.

QSV822 Financial Management in Construction 3 Units

Importance of financial management to project management. Evaluation of the significance of financial matters in decision making by all participants in the project process, process of financial reports, analysis. Financial strategies and instruments for ensuring the solvency & sustainability of corporate business ventures. Methods of raising capital & the issue in portfolio management in the light of risk and rewards associated with investment initiatives. Project financing options (private finance & joint venture initiatives). Company financial Structure- Depreciation, Budgeting, cash flow, Lock-up, working capital, costs and break-even Analysis. Cost control, variance analysis. Time Value of money. Capital investment appraisal. Servicing and repayment of loans, methods of Loan renegotiation and rescheduling.

QSV 823 Management of Design & Construction 3 Units

Management and control of construction project by contractors and management of design projects by designers, engineers, architect and Quantity Surveyor. The theory and practice of design and construction of buildings. Design methods and Process, production methods and processes in the building sites. Influence of large unskilled labour and construction plant on design and construction

methodologies. Innovative value judgement of design and construction team within the construction industry. Practical examples of application of both contractors and design offices.

QSV 824 Project Performance Management

3 Units

Introduction to construction productivity analysis and performance management. Life cycle of performance measurement system. Balance score card. Key Performance Indicators. Factors affecting construction productivity. On-site factors-job conditions, preplanning management coordination, human factors, equipment utilization, material handling, site organization, work environment (temperature, humidity and wind). Offsite factors- government regulation, financial status organization and contractual constraints, suppliers etc. Direct productivity measurement; production units/ inputs unit. Indirect productivity measurement-work sampling five-minute rating, time-motion study etc. Construction productivity improvement- constructability study, selection of designer contractor, and construction measurement firm etc. Benchmarking- history & principles of benchmarking.

QSV 825 International Management Issues in Construction 3 Units

History of modern contracting current situation & future trends. The role of culture in construction management. International construction markets and emerging trends. Managing construction in international settings. International Joint Ventures, Technology transfer, Partnering and strategic alliance. Quality management in construction international standards, -180 140000- safety standards. Private finance of public infrastructure. The nature of international market. The major parties (from) actually improved in international construction; international contracts & bidding strategies. The financial aspect of international construction & international agencies. Case studies in emerging issues for construction management in specific countries.

QSV 826 Human Resources Management 3 Units

Integration of the needs of organisation and those of the individual to maximize motivation & to develop leadership styles and workplace practices that are appropriate for managing projects & people. Analysis of the value of people set within organisational culture & management of change strategies & practices. Human resources considerations in the construction industry. Linking theoretical models of human behavior to practical personnel issues in construction.

QSV 827 Organizational Change 3 Units

Management of change & how this affects an organization's ability to identify, define and engage with the management & control of business development. Theoretical models of organisational change, responsiveness to competitive pressure & organizational audit.

QSV 828 Planning and Operation of Production System 3 Units

Objectives of production systems, constraints, Conflicts and external influences. Formulating Site policy and procedure. Site organizational structures .Project planning prior to and during construction stage and short term planning and scheduling technique. Production control- techniques, information control and feedback, use of decision rules.Quality control procedures on the site. Supervision- staff and labour organization, industrial relationships, site meetings procedures, site records. Plant and materials management and information flow. Materials management (onsite and offsite).Importance of construction control of construction plant and equipment with emphasis on site applications. Acquisition, maintenance, organization and financial management of construction plant by contractors plant divisions and plant hire companies. Influence to tax on buying of new equipment.

QSV 899 Master's Thesis Research Project 1 2 Units

This should consist of an independent work with sound theoretical and investigative approach in a chosen area of Quantity Surveying/ Construction management leading to an original contribution to knowledge.

C. DOCTOR OF PHILOSOPHY

QSV 999 PhD Thesis Research Project

Original research project, which must involve independent investigations into any research focus in Quantity Surveying/ Construction Management. The product of the research must form a definite contribution to knowledge. Every candidate must present at least two successful seminars before the submission of Ph.D thesis for examination. The thesis format must be in accordance with FUTA standard.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF QUANTITY SURVEYING (QSV)

S/N	NAME	QUALIFICATION	STATUS	PHONE NUMBER	AREA OF SPECIALISATION
1.	Dr. A. E. Oke	B.Tech (QS), M.Tech Ph.D (QS), Akure, MNIQS, MAQS, MNIM, RQS	Reader	08038060429	Project Management, Sustainable Construction, Digital Development and Value Management
2.	Dr. J. A. Akinola	B.Tech (QS)Akure; M.Sc. (Construction Management) Ife; MBA (Akure); PhD. QS, (Akure); FNIQS, RQS.	Professor	08038840498	Resources Procurement and Professional Practice
3.	Prof. D. R. Ogunsemi	B.Sc. (Bldg), Ife M.Sc., Ife Ph.D(QS), Akure FNIQS, FNIOB, RQS. R. Bldr	Professor	08034708799	Cost Management, Procurement Studies, Housing Studies & Project Management
4.	Prof. I. O. Aje	B.Tech, M.Tech, Ph.D (QS)Akure FNIQS, MAQS, RQS	Professor	08034746985	Construction Contract Procurement & Administration Procurement Studies, Cost Management, Measurement of Construction Works
5.	Prof. O. A. Awodele	B.Tech, M.Tech, Akure (QS) Ph.D (Construction Project Management) Scotland; FNIQS,RQS, MAPM	Professor	08034908021	Project Management, Measurement, Contract Admin, Procurement Studies, Risk Management and Safety Mgt.
6.	Prof. F. O. Akinradewo	HND (QS); PGD (QS), Akure M.Sc. (Construction Management) Akwa , PhD. (QS), Akure FNIQS, RQS, MCI Arb.	Professor	08033588988	Construction Management, Measurement, Professional Practice & Construction Claims Management
7.	Dr. N. Saka	B.Tech, (QS) M.Tech (Construction Management) Minna, Ph.D. Glasgow. AMNIM, MNIQS	Reader	07064638973	Construction Economics, Construction Management, Risk Management.
8.	Dr. (Mrs.) C. O. Ade-Ojo	B.Tech, M.Tech PhD (QS) Akure, FNIQS, MNIM, RQS	Reader	08035796823	Sustainable Development, PPP, Construction Economics/Management
9.	Dr. I. O. Famakin	B.Tech, M.Tech (QS) Akure PhD (Const. Eng. & Mgt.) MNIQS, RQS, GMNIM	Senior Lecturer	07054636337	Construction Economics, Cost Management
10.	Dr. Mrs. T. F. Adegbembo	B. Tech, M. Tech PhD (QS) Akure, MNIQS,	Senior Lecture	08035775143	Procurement, Knowledge Management, Construction Economics
11.	Dr. Mrs. D. T. Moyanga	B.Tech, M.Tech (QS), PhD (QS) Akure	Senior Lecture	08036967795	Contract Procurement, Construction Economics/Management, Organizational Management

9.6.6 DEPARTMENT OF SURVEYING AND GEOINFORMATICS (SVG)

AVAILABLE OPTIONS/SPECIALIZATIONS

(a) Postgraduate Diploma (PGD) in Surveying and Geoinformatics

(b) Master of Technology (M.Tech) in Surveying and Geoinformatics with specializations in:

(i) Geodesy
(ii) Photogrammetry
(iii) Remote Sensing
(iv) Hydrography
(v) Geoinformatics

(c) Doctor of Philosophy (Ph.D) in Surveying and Geoinformatics with specializations in:

(i) Geodesy
(ii) Photogrammetry
(iii) Remote Sensing
(iv) Hydrography
(v) Geoinformatics

PHILOSOPHY AND OBJECTIVES

(i) Post Graduate Diploma (PGD) Programme

The philosophy of this programme is to create an enabling environment of interaction between those candidates who have acquired technological experience with limited academic exposure and those graduates in Surveying and Geoinformatics who may not have gone through the rigors of practical experience. This will produce a blend of Surveyors who will function effectively in the areas of Surveying and Geoinformatics. Specific objectives are to:

(a) bridge the gap between the Higher National Diploma and First degree in Surveying and Geoinformatics in order to allow the former pursue higher degree programmes and also qualify them for registration with Surveying and Geoinformatics professional bodies;

(b) train those who may wish to make up their deficiencies in first degree to qualify them for admission into Masters Degree programme in Surveying and Geoinformatics; and

(c) produce qualified professional, project analysts and project developers in the broad areas of Surveying and Geoinformatics.

(ii) Master of Technology (M.Tech.) Programme

The philosophy of the M. Tech. programme is specifically directed towards providing graduates with the opportunity for further studies and research in the specialized areas of Surveying and Geoinformatics.

Specific objectives are to:

(a) provide an advanced knowledge for the holders of Postgraduate Diploma (PGD) and Bachelor of Technology/Science Degree in Surveying and Geoinformatics which qualifies them for admission into Ph.D Degree in Surveying and Geoinformatics; and

(b) produce qualified surveyors, research/project analysts and project developers in the broad areas of surveying and geoinformatics.

(iii) Doctor of Philosophy (Ph.D)

The philosophy of the Ph.D programme is specifically directed towards providing qualified candidates with the opportunity for further studies and research in the specialized areas of Surveying and Geoinformatics.

Specific objectives are to:

(a) provide advanced knowledge and skills for the holders of Master of Technology (M.Tech.) Degree in Surveying and Geoinformatics; and

(b) produce qualified researchers, research project analysts and project developers in the specialized areas of Surveying and Geoinformatics.

ADMISSION REQUIREMENTS

(a) Post Graduate Diploma Programme

Candidates for admission to the programme should possess any of the following qualifications:

(i) B.Tech./B.Sc. in Surveying and Geoinformatics with at least Third Class Honours Division of The Federal University of Technology, Akure or any other recognized University.

(ii) B.Tech./B.Sc. in Mathematics, Physics, Geography, Quantity Surveying, Building Technology, Architecture, Estate Management, Urban and Regional Planning, Remote Sensing and Geoinformation Sciences, Engineering and Computer Sciences with minimum of Second Class Honours (Lower Division) of The Federal University of Technology, Akure or any other recognized University.

(iii) Higher National Diploma in Surveying and Geoinformatics with minimum of Lower Credit from the NBTE accredited programme of Monotechnics, Polytechnics and Colleges of Technology.

b. Master of Technology (M. Tech.)

Candidates seeking admission to the programme must possess any of the following qualifications:

(i) B.Tech./B.Sc. Degree in Surveying and Geoinformatics with a minimum of Second Class Honours (Lower Division) of The Federal Universitof Technology, Akure or any other recognized University.

(ii) Postgraduate Diploma (PGD) in Surveying and Geoinformatics with a minimum of Upper Credit of Federal University of Technology, Akure or any other recognized University.

(b) Doctor of Philosophy (Ph.D)

Candidates seeking admission to the programme must possess M.Tech./M.Sc. Degree and attain a weighted

average of at least 60% or minimum CGPA of 3.5 on a 5.0 point grade in the relevant area of Surveying and Geoinformatics of The Federal University of Technology, Akure or any other recognized University.

DURATION OF PROGRAMMES

(a) Post Graduate Diploma (PGD) Programme

The programme will be for minimum of 18 months and on full-time basis.

(b) Master of Technology (M. Tech.) Programme

The programme will be for a minimum of eighteen months (18) and maximum of 24 months on full time basis.

(c) Doctor of Philosophy (Ph.D) Programme

The programme runs for minimum of thirty six months (36) on full time basis while it will be for a minimum of forty eight (48) on part-time basis.

GRADUATION REQUIREMENTS

(a) Post Graduate Diploma (PGD) Programme

Candidates must pass a total of 38 units. This is made up of 32 units of course work and 6 units of research project.

(b) Master of Technology (M.Tech.) Programme

Candidate must pass a total of 36 units. This is made up of 24 units of course work and 12 units of research work. Also, candidate is expected to present 2 seminars and pass oral examination based on his/her research work before panel of examiners.

(c) Doctor of Philosophy (Ph.D) Programme

Candidate is expected to present 3 seminars and pass an oral examination based on his/her thesis before panel of examiners.

COURSE OUTLINE FOR THE PROGRAMMES

Post Graduate Diploma (PGD) Programme First Semester

Course Code	Course Title	L	T	P	U
SVG 701	Applied Survey Computation I	2	1	0	3
SVG 703	Geodesy I	2	0	0	2
SVG 705	Photogrammetry I	2	0	0	2
SVG 707	Remote sensing Applications I	1	0	3	2
SVG 709	Geoinformatics I	1	0	3	2
SVG 711	Hydrography I	1	0	3	2
SVG 713	Geophysical Surveying	1	0	3	2
	Total				**15**

Second Semester

Course Code	Course Title	L	T	P	U
SVG 702	Applied Survey Computation II	2	0	1	3
SVG 704	Geodesy II	1	0	3	2
SVG 706	Photogrammetry II	1	0	3	2
SVG 708	Remote sensing Applications II	1	0	3	2
SVG 710	Geoinformatics II	1	0	3	2
SVG 712	Hydrography II	1	0	3	2
SVG 714	Seminar on Geospatial Issues	1	0	3	2
	Total				**15**

Third Semester

Course Code	Course Title	L	T	P	U
SVG 715	Computer Applications	2	0	0	2
SVG 799	Research Project	0	0	18	6
	Total				**8**

(a) Master of Technology (M. Tech.) Programme First Semester

Course Code	Course Title	L	T	P	U
SVG 801	Data Acquisition Systems I	2	1	0	3
SVG 803	Applied Mathematical Methods	2	1	3	3
SVG 805	Spatial Statistics	2	1	0	3
SVG 807	Research Methodology	2	1	0	3
	Elective	2	1	0	3
	Total				**15**

Elective Courses

Course Code	Course Title	L	T	P	U
SVG 809	Advanced Geometric Geodesy	2	1	0	3
SVG 811	Advanced Hydrographic Surveying I	1	1	3	3
SVG 813	Advanced Remote Sensing I	1	1	3	3
SVG 815	Advanced Photogrammetry I	1	1	3	3
SVG 817	Advanced Concepts in Geoinformatics	2	1	0	3

Second Semester

Course Code	Course Title	L		T	P	U
SVG 802	Data Acquisition Systems II	1	1	3	3	
SVG 804	Advanced Data Structure	2		1	0	3
	Elective Course	2		1	0	3
	Total					9

Elective Courses

Course Code	Course Title	L	T	P	U
SVG 806	Advanced Physical Geodesy	2	1	0	3
SVG 808	GIS Implementation Strategies	2	1	0	3
SVG 812	Advanced Hydrographic Surveying II	1	1	3	3
SVG 814	Advanced Remote Sen sing II	1	1	3	3
SVG 816	Advanced Photogrammetry II	1	1	3	3

Third Semester

Course Code	Course Title		L	T	P	U
SVG 899	Research Project		0	0	36	12

(a) Doctor of Philosophy (Ph.D) Programme

Course Code	Course Title	L		T	P	U
SVG 999	Ph. D Research Project					

COURSE SYNOPSES

(a) POST GRADUATE DIPLOMA (PGD) PROGRAMME

SVG 701 APPLIED SURVEY COMPUTATION I (3 UNITS)

Theory of errors, Linear and non linear least squares estimation. Matrices, diagonalization. Least squares adjustment techniques: condition equations, observation equations, combined model, weight and functional constraints. Solution of normal equations, addition of observation and parameters, removal of observations. Treatment of large geodetic networks.

SVG 702 APPLIED SURVEY COMPUTATION II (3 UNITS)

Quality control: Statistical analysis, error ellipse, internal and external reliability of survey network. Correlation and regression. Classification and analysis of interdependence. Prediction: Interpolation, extrapolation. Analysis of spatial pattern. Representation of spatial distribution, Surface trend modeling.

SVG 703 GEODESY I (2 UNITS)

Geometry of an ellipse, Geodetic, geocentric and reduced latitudes. Computation of latitude differences. Space rectangular coordinates. Radii of curvature and Gaussian mean radius. Lengths and areas on the ellipsoid. Radii of spherical approximations to the ellipsoid. Curves on the ellipsoid: normal section and geodesic.Ar c lengths of normal sections. Separation between reciprocal normal sections. Special properties of geodesic. Direct and inverse problems on the sphere and ellipsoid. Geodetic datum and use of ellipsoid as a reference surface. Transformation of coordinates from one datum to another.

SVG 704 GEODESY II (2 UNITS)

The earth and its gravity field, potentials, geoidal undulation and deflection of vertical. Geopotential numbers, height systems: orthometric, dynamic and normal height systems. The earth, its size and shape: actual shape; approximations (geoid and other figures of the earth). Gravity observations: absolute and relative. Gravity reduction and gravity anomalies. Basic concept of satellite geodesy, Positioning methods: dynamic and geometric observations. TRANSIT and NAVSTAR GPS systems. Integration of satellite data with other geodetic network data.

SVG 705 PHOTOGRAMMETRY I (2 UNITS)

Definition and general introduction. Photographic principles and optical characteristics. Properties of aerial photograph. Elementary mapping from photographs e. g. radial line and slotted template methods of producing planimetric maps. Principles and use of cameras, sketchmaster, stereoplotters and comparators. Preparation of photomosaics. Preparation of thematic maps.

SVG 706 PHOTOGRAMMETRY II (2 UNITS)

Procedures and mapping by photogrammetric methods: Analogue, analytical and digital photogrammetric methods. Project planning/costing of photogrammetric projects. Proposal writing (with specification) of photogrammetric projects. Application of photogrammetry to engineering problems. Photogrammetry and GIS.

SVG 707 REMOTE SENSING APPLICATIONS I (2 UNITS)

General theory of non-contact mapping methods and their

advantages. Electromagnetic radiation and interaction with matter. E-M spectrum especially the optical wave/lengths. Types and design of electromagnetic sensors. The photographic camera, Radiometers, thermal scanners and multispectral scanners. Sensor platforms. Introdution to digital processing. Elements of photo-interpretation.

SVG 708 REMOTE SENSING APPLICATIONS II (2 UNITS)

Sensor platforms. Geometry of artificial satellite orbits. GPS positioning, Fundamentals of pattern recognition, functions. Pattern classifier concepts. Digital image processing. Pre-processing of RS data, image enhancement techniques, image transforms. Filtering. Classification techniques.

SVG 709 GEOINFORMATICS I (2 UNITS)

Definition and basic concept of GIS. Elementary of mathematical concepts of graph theory, set theory and topology. Components of GIS. Field-based and object based concepts of real world. Spatial data models: 2D, 3D and 4D models. Tessellation data model, vector data models, tessellation versus vector spatial relationships: metric, topologic and spatial order. Data quality, positional accuracy, attribute accuracy, logical consistency. Semantic data modeling,, database structures: relational, network and hierarchic. Object oriented data modeling. Object-relational data structure. Applications: topographic, cadastral, utility and environmental database. Computer graphics: Digital representation of graphic objects: Point, line and polygon elements. Digital representation of cartographic symbols and name placement. Data structures.

SVG 710 GEOINFORMATICS II (2 UNITS)

GIS subsystems: data collection and input, data storage and retrieval data manipulation and analysis, visualization and reporting. Structured query language (SQL). Database management system (DBMS): types and functions, review of some existing GIS software. Database design steps and implementation. Specific study of a topic under one of the following areas (each student is required to submit a term paper on the chosen topic):

(a). Topographic information system, (b) Cadastral information system, (c) Environmental information system Raster and vector graphics, Hardware and software graphic systems. Coordinate transformation for orthogonal and perspective projections. Data structure for computer graphics; 2D and 3D graphics, map analysis.

SVG 711 HYDROGRAPHY I (2 UNITS)

Introduction to hydrography, coastal processes- waves, tides, tidal streams, currents including longshore, river and tidal density, chart and sounding datums. Determination of sea level and mean sea level, tide poles and tide gauges. Two-dimensional positioning at sea, bathymetry, positioning accuracies. Measurement systems, optical and electronic methods, sources of errors. Introduction to satellite navigation and positioning.

SVG 712 HYDROGRAPHY II (2 UNITS)

Sounding, wave propagation, Matthew's charts, vertical beam, echo sounder instrumentation, operation, calibration. Acoustic waves. Ports development and port management, Sweeping, side looking sonar, multibeam sonar, electronic sweeping. Element of oceanography, tides, currents, temperature, salinity, dredging and channelisation pressure measurement sedimentation, beach erosion. Modern techniques in hydrography.

SVG 713 GEOPHYSICAL SURVEYING (2 UNITS)

Introduction to geophysical surveying; Geophysical surveying methods (i.e. Gravimetric, Magnetic, Electrical, and Seismic methods) and matching methods to applications; planning geophysical survey and geophysical survey design. Gravimetric method: Gravity measurement, gravity reduction (Bouguer, Free Air, Terrain, Local Latitude, Isostatic, etc corrections), reduced gravity, normal gravity, gravity anomaly, regional gravity anomalies and residual gravity anomalies, applications in geophysical exploration.

SVG 714 SEMINAR ON GEOSPATIAL ISSUES (2 UNITS)

Instructions on the preparation, discussion and presentation of critical review of topics on important geospatial problems. Introduction to research technique on important topics bordering on Geospatial problems. Student's research on topical issues in Geospatial data handling. This should be prepared and orally defended. Also, it includes written presentation of reports.

SVG 715 COMPUTER APPLICATIONS (2 UNITS)

Computer programming: Flowchart, Algorithms, Visual Basic, Visual Fortran, Development of simple programs and routines for basic surveying operations – Traversing, Leveling, Triangulation, Photogrammetry, Hydrography, etc. Development and applications of software for least squares solution surveying and geoinformatics problems such as coordinates computations, areas and volumes of earth works, production of map series.

SVG 799 RESEARCH PROJECT 6 UNITS)

Proposal of the project, which includes introduction, definition of problem(s), statements of objectives, working hypothesis and methodology must be defended and approved by the departmental board of examiners.

(a) MASTER OF TECHNOLOGY (M. TECH.) PROGRAMME

SVG 801 DATA ACQUISITION SYSTEMS I (3 UNITS)

Definitions: Electromagnetic radiation, transmission absorption and reflections; types of sensing devices and

platforms, Digital techniques for enhancement, transformation, filtering, classification of geometric corrections, masking and feature extraction. Integration with other data sources. Applications in Environmental and physical sciences. Implementation details and exercises, Introduction to aerial photographs, Analytical treatment of photographic measurements, Introduction to digital photogrammetry, principles of photogrammetric mapping.

SVG 802 DATA ACQUISITION SYSTEMS II (3 UNITS)

Basic concepts of positioning, positioning on dynamic surface, control establishment, electroning surveying, GPS position determination: Static, DGPS, kinematic, pseudo-kinematic, rapid-static, on-the-fly. Real-time kinematic RTK. Planning a GPS survey: single difference, double difference, triple difference, post-processing of GPS data. GPS software. Basics of topographic mapping, map projection.

SVG 803 APPLIED MATHEMATICAL METHODS (3 UNITS)

Review of matrix algebra; solution of systems of linear equations; direct and indirect methods. Least square models: parametric method, method of correlates and mixed models. Weight and functional constraints. Treatment of large geodetic networks and special network. Univariate Statistics: Statistical distribution, Interval estimations and hypothesis testing.

SVG 804 ADVANCED DATA STRUCTURES (3 UNITS)

Data modeling: definition, purpose, components, methodology, raster and vector data models. Raster and quad tree data structures. Spatial relationships, emergence of database technology, different views of data base, architector. Database designs: relational, network, hierarchical and binary relationship models. Database query and manipulation. Distributed databases. Arc-node topology using database linking spatial and attribute information. Map productions. GIS functionality: point- and line-in-polygon, buffering, overlays. Implementation details and exercises using PC Arc/Info and Oracle.

SVG 805 SPATIAL STATISTICS (3 UNITS)

Advanced statistical analysis and graphics. Surface modeling. The methods of least squares and error analysis. Basic concepts of system modeling. Contouring, interpolation methods, kriging and co-kriging. Visualization methods and imaging. Applications in environmental science. Spatial phenomena and spatial processes, spatial data analysis. Variogram, semi-variogram. Estimation and modeling of non-stationary covariances.

SVG 806 ADVANCED PHYSICAL GEODESY (3 UNITS)

The earth's external gravity field and the figure of the earth. The boundary value problem of physical geodesy. The problem of the geoid, regularized and actual geoid. Reduction to the geoid. Direct determination of the physical surface of the earth. Astrogeodetic, gravimetric and astrogravimetric methods of geoid determination. Methods of satellite geodesy. Gravity field estimation: Least squares and least squares collocation approaches.

SVG 807 RESEARCH METHODOLOGY (3 UNITS)

The aim is for developing a good post graduate research proposal. Importance will be attached to the identification of research problem(s), literature review, significance of the research, acquisition of data, quality of data, processing of data which include development/derivation of relevant mathematical models (if any) and numerical investigations of the solutions to problems, descriptive and inferential statistical analysis of the results, research contributions to knowledge, conclusions and recommendations.

SVG 808 GIS IMPLEMENTATION STRATEGIES (3 UNITS)

User needs definition and GIS product requirements, requirement analysis and feasibility evaluation, developing a workable solution and implementation plan, system implementation, system design, database design, system installation, training and support, system testing, documentation.

SVG 809 ADVANCED GEOMETRIC GEODESY (3 UNITS)

Review of the properties of the ellipsoid. Curves on the surface of the ellipsoid. Solution of the direct and indirect problems on the ellipsoid. Astrogeodetic deflections of the vertical and the laplace equation. Reduction of observations to the ellipsoid. Observation equations for triangulation, trilateration and traverse computations on the ellipsoid. Best fitting and general terrestrial ellipsoids. Datum definition and determination. Datum transformation. Geometric methods of satellite geodesy

SVG 811 ADVANCED HYDROGRAPHIC SURVEYING I (3 UNITS)

Tide and tidal currents, their measurement and interpretation. Principle of harmonic analysis and prediction of tides. Tidal datum planes, Graphical analysis. Characteristics of tides in bays, current meters, and amphidromic systems. Oceanographic sounding and positioning a float. Hydrographic measurements, Automation and programming, data analysis. Law of the sea. Revision of geodetic principle for control establishment, vertical control observations and computations necessary to establish tidal datum. Shore line mapping by ground survey and photogrametric methods. Appreciation of the limitations of nautical chart.

SVG 812 ADVANCED HYDROGRAPHIC SURVEYING II (3 UNITS)

Surveying management and project planning, including tendering and contracting procedures, element of sedimentary processes. Quality control and analysis of

positioning methods, control for dredging and reclamation, conservancy law reports, visual and radar navigation systems, sand mining and required regulations. Analysis, Planning and execution of projects. Dynamic oceanography, coastal oceanography, air ocean fluid dynamics. Quality control in bathymetry.

SVG 813 ADVANCED REMOTE SENSING I (3 UNITS)

Electromagnetic energy, electromagnetic spectrum, remote sensors, aircraft and space craft remote sensing systems. Landsat satellite system data. Atmospheric errors in remotely sensed data. Reflection, Spectral characteristics of objects:

Vegetation, soil, water. Analysis of data: qualitative and quantitative analysis.

SVG 814 ADVANCED REMOTE SENSING II (3 UNITS)

Statistical properties of digital data. Pattern recognition. Digital image classification: supervised and unsupervised methods. Mathematical algorithms for image classification, cluster analysis, maximum likelihood, separating hyperplanes. Cartographic accuracy of digital satellite imagery. Comparison of Landsat and spot satellite digital image rectification. Computer supported production of thematic maps. Error correction of image data. Correction of radiometric and geometric distortions. Radiometric and geometric enhancement techniques.

SVG 815 ADVANCED PHOTOGRAMMETRY I (3 UNITS)

Concepts of collinearity and coplanarity, Collinearity equations. Correction of Systematic Errors, Analytical Relative Orientation. Analytical approach to independent models, weight constraints in Photogrammetry, Bundle Adjustment, Self-calibrating Adjustment system. Least squares methods in the adjustment of large Aero-triangulation blocks; first and second order partitioned regression (course is strictly computer oriented).

SVG 816 ADVANCED PHOTOGRAMMETRY II (3 UNITS)

Scanners, digital cameras, features extraction, automated digital terrain modeling (DTM), digital aerotriangulation, digital orthophoto, digital photo workstation and digital photogrammetry applications including: image scanning and digital cameras, orientation of digital photogrammetric images, digital terrain model, digital orthophoto, plotting in mono and stereo, digital photogrammetric workstation. Mapping from space (modeling the perspective geometry of line cameras), Multi-sensor aerial triangulation (integrating aerial and satellite images with Navigation data).

SVG 817 ADVANCED CONCEPTS IN GEOINFORMATICS (3 UNITS)

Relational Data Base Design: Normalization and implementation; Object – oriented Database Design and implementation; Building of Topographic Information System: Topographic database, data requirements, design steps and implementation. Data modeling: definition, purpose, components, methodology, Multi Criteria Evaluation (MCE), Multi Objective Land Allocation (MOLA), Markov Chain. Database design: relational, network, hierarchical and binary relationship models. Database query and manipulation. Distributed databases. Arc-node topology, using a database linking spatial and attribute information. Map production. Point and Line-in polygon, buffering, overlays. Implementation details and exercises using Arc/info, TNT MIPS, and Idrisi etc. Computer programming in GIS: Visual basic, any other object-oriented programming language, source codes for GIS basic functions, customized GIS programs.

SVG 899 RESEARCH PROJECT (12 UNITS)

Each candidate will be assigned a supervisor who will assist him/her in the choice of a research topic. Candidates, who are expected to work independently, should always seek their supervisors' guidance throughout the research. Each candidate is expected to defend his/her proposals, which include introduction, problem definition, literature review and methodology, before a panel of internal examiners.

DOCTOR OF PHILOSOPHY (PH.D) PROGRAMME

SVG 999 Ph. D RESEARCH PROJECT

Original research project which must involve independent investigations into any research focus in Surveying and Geoinformatics. The product of the research must form a definite contributions to knowledge. Every candidate must present at least three successful seminars before the submission of Ph.D thesis for oral examination.

LIST OF ACADEMIC STAFF IN SURVEYING AND GEO-INFORMATICS DEPARTMENT (SVG)

S/N	NAME	STATUS	AREA OF SPECIALIZATION
1	Prof. T. O. Idowu	Professor	Geodesy
2	Dr. H. Tata	Senior Lecturer	Geodesy
3	Dr. V. A. Ijaware	Senior Lecturer	Geoinformatics
4	Dr. S. O. Ogunlade	Senior Lecturer	Remote Sensing
5.	Dr. I. U. Nzelibe	Senior Lecture	Geodesy

9.6.7 DEPARTMENT OF URBAN AND REGIONAL PLANNING (URP)

1. PROGRAMMES OFFERED.

a. Postgraduate Diploma in Urban and Regional Planning
b. Master of Technology in Urban and Regional Planning
c. Doctor of Philosophy (Ph.D) in Urban and Regional Planning

2. AVAILABLE OPTIONS IN URBAN AND REGIONAL PLANNING AREA OF SPECIALIZATIONS.

a. Postgraduate Diploma in Urban and Regional Planning
b. Master of Technology in Urban and Regional Planning
c. Doctor of Philosophy (Ph.D) in Urban and Regional Planning

A. POSTGRADUATE DIPLOMA (PGD) PROGRAMMES

1.0 PHILSOPHY AND OBJECTIVES.

The post graduate diploma in (PGD in Urban and Regional Planning offer an educational opportunity designed to meet the specific needs of those who want to move up the profession. It is specifically designed for those who have successfully completed their Higher National Diploma (HND) in a Polytechnic or college of Technology but could not proceed to University for a Master degree on account of the terminal nature of the HND. Successful candidates of this PGD programme can register for the master's degree Programme or work in our variety of planning agencies.

The Postgraduate Diploma in Urban and Regional Planning is designed to meet the following specific objectives:

i. To .provide a pool of professional manpower imbued with a deep understanding of the art and science of physical planning so as to reduce the Manpower shortage experienced at various levels of government and private planning agencies.
ii. To give opportunity to HND students aspiring for the postgraduate degree in Urban and Regional Planning in recognized universities. The programme will qualify them for further studies in Masters Degree programme.
iii. To provide opportunity to work in the variety of planning agencies and subsequent lateral crossing into the professional cadre.
iv. To produce a crop of student who can meet the Registration requirement of our professional societies such as NITP and TOPREC.

2.0 ADMISSION REQUIREMENTS

Applicant for this programme should be:

i. Holders of first degree in Environmental Studies, Social Sciences and Engineering, among others (with the exemption of holders of B.ED degree).
ii. Holders of HND with a minimum of Upper Credit pass in Town Planning
iii. Holders of HND with Lower Credit in Town Planning with a minimum of three (3) years of working experience in Planning related fields.
iv. In addition, an applicant may be required as a condition of admission to undergo a selection process.

3.0 DURATION OF PROGRAMME

The academic programme is by course work with a supervised project. It runs for FOUR SEMESTERS FULL TIME. It is based on course unit system where the number of contact hour is paramount as the deciding factor.

4.0. REQUIREMENTS FOR GRADUATION.

Student shall be evaluated using examination and course work assessment. There shall be four semesters examinations plus continuous assessment. The semester's examination question shall cover all aspect of the syllabus contents for the course. In the case of studio design work, a mid-jury and final semester jury shall be conducted. Students are to defend their design their designed project for the terminal semester would be defended.

COURSE OUTLINE

First Year (1st Semesters) Core Courses

Course Code	Course Title	L	T	P	U
URP 701	Planning Theory	3	0	0	3
URP 703	Planning Studio (Neighbourhood Design)	3	0	0	3
URP 705	Advance planning principle & Techniques	3	0	0	3
URP 707	Transportation Planning	2	1	0	3
URP 709	Urban Economic	2	0	0	2
URP 711	Planning and computer Application	2	0	0	3
URP 713	Application of GIS to Urban and Regional Planning	2	0	3	3
	Total	**17**	**1**	**9**	**19**

Electives (options)

Course Code	Course Title	L	T	P	U
URP 715	History and evolution of Planning Thought.	2	0	0	2
URP 717	Population and Urbanization Studies	2	0	0	2
	Total	19	1	9	21

First Year (2nd Semesters) Core Courses

Course Code	Course Title	L	T	P	U
URP 702	Quantitative Techniques	3	0	0	3
URP 704	Planning Studio II (Landscape Design)	3	0	6	3
URP 706	Planning Law and Administration	3	0	0	3
URP 708	Housing Process	2	0	0	2
URP 710	Environmental Engineering (Public Utilities)	3	0	0	3
URP 712	Coastal Management and Planning	2	0	3	3
	Total	**16**	**0**	**9**	**17**

Electives (options)

Course Code	Course Title	L	T	P	U
URP 714	Tourism Planning	2	0	3	3
URP 716	Urban Renewal	2	0	0	3
	Total	**18**	**0**	**9**	**19/20**

Second Years (1ST Semesters) Core Courses

Course Code	Course Title	L	T	P	U
URP 721	Planning Studio (Regional Planning)	3	0	0	3
URP 723	Seminar on Contemporary	9	0	0	3
URP 725	Project Planning, evaluation and Financing	3	0	0	3
URP 727	Natural Resources Planning and Development	2	0	0	2
URP 729	Site Selection	3	0	0	3
URP731	Terminal Project (Dissertation)	3	0	0	3
	Total	**3**	**0**	**6**	**17**

Electives (one option)

Course Code	Course Title	L	T	P	U
URP 733	Rural Development and Planning	2	0	0	2
URP 735	Settlement Planning	2	0	0	2
	Total	**5**	**0**	**6**	**19**

Second Year (2ND Semester) All Core

Course Code	Course Title	L	T	P	U
URP 722	Planning Practice	1	0	0	3
URP 724	Environmental planning and Management	3	0	0	3
URP 726	Research Techniques and Methodology	3	0	0	3
URP728	Regional Analysis	3	0	0	3
URP 730	Environmental Impact Analysis (EIA)	3	0	0	3
URP 732	Terminal Project	-	-	-	6
	Total	**15**	**0**	**0**	**21**

COURSE SYNOPSES

URP 701: PLANNING THEORY

Theories and planning. Procedural and substantive planning theories; theories 'IN', theories OF and theories FOR planning. Detail study of rational comprehensive planning theory. Incremental planning, mixed scanning, Advocacy and Radicalist humanistic planning theory. System Approach to planning, Innovative planning, Corporate planning and strategic planning. The relationship of the planning theories to the preparation of Master plan, structure planned local plan. The concepts of need in planning. Citizen participation and evaluation in planning process. Social sciences contribution to the development of planning theory. Caring for the multi-cultural system. cities/regions in planning systems. Expectation versus

experience. General planning environment.

URP702: QUANTITATIVE TECHNIQUES

Simple Analytical Techniques for Analyzing Urban and Regional Planning Data. Descriptive Statistics and their relevance to Urban and Regional Planning. Forecasting Techniques. Inferential Statistics for Parametric and Non-Parametric Analysis. Regression Analysis. Quantitative Models in Urban and Regional Planning. Spatial Interaction Models

URP 703: PLANNING STUDIO I

Macro theories of design. The formulation of minimum and desirable space standards. Ecological approaches too urban and regional design. Visual elements in an urban and regional design. Visual element in an urban complex. Design resources, design composition, Space articulation and Aesthetic Qualities, Site planning and design for neighbourhoods - industrial, agricultural, commercial and recreational interaction land use. Practical assignment on site planning particularly the design of Housing, Industrial and Commercial Estates. Preparation of three-dimensional models.

URP 704: LANSACPE PLANNING

Values, forces and institution shaping Urban Form. Principles in Urban design. Organization of space. Elements within organized space Movement and Scale. Theoretical concepts and approaches to urban design realities in Nigeria towns and cities e.g. Functional distribution of mass and voids in relation to circulation and amenities., Study of manageability. Images of the city. Behavioural basis for design. The search for meaningful community form.

URP705:ADVANCED PLANNING PRINCIPLES AND TECHNIQUES

Analysis and seasonal variations. Aerial photography, methods of photo-interpretation and construction urban area maps and introduction to Remote Sensing. Rationalization and delineation techniques and their applicability to the Nigerian context. Techniques of understanding spatial structure. Analysis of Structure of formal regions e. g. Cluster and fact or analytical methods. Analysis of structure of nodes – hierarchy of structure of links and interactions, network analysis, information flows and spatial interaction. Strategic choice and Analysis of Interconnected Decision Areas (AIDA). Threshold analysis and its application. Evaluation Technique, Cost-Benefit Analysis, Project Planning Balance Sheet and GoalAchievement Matrix, etc

URP 706: PLANNING LAW AND ADMINISTRATION

Detailed studies of planning acts and Legislation in Nigeria. Land Laws, Public Health Code and the Housing code. Laws on compensation and compulsory acquisition with special reference to Nigeria. Local government reforms in Nigeria and effects on Urban Planning. Urban government systems, the enforcement of development control, zoning and politics of planning in Nigeria. Appraisal of TOPREC Decree, FEPA Decree and Code of Conducts of the Nigerian Institute of Town Planners.

URP 707: TRANSPORTATION PLANNING

Land use and transportation planning, Traffic generation, distribution, modal split and assignment, methods of Traffic forecasting, origin and destination surveys. Design of road alignment, speed, sight distance, lanes and carriage ways, safety regulations and Transport network design standards. Mass transit in Urban centres. survey analysis and protection of mass transportation terminal facilities like railway stations. Preparation of a circulation plan/transportation plan as an integral part of the comprehensive urban development plan. Formulation and communication problems. Social infrastructures. EIA. Community Participation and other resources sustainability strategies, Existing Management agencies and policy. Policy adjustment and re-orientations.

URP 708: HOUSING PROCESS

Aims and objectives of housing policies and programmes in Nigeria. Priorities of urban and rural housing. Housing as a sector of investment and integral part of national plans in Nigeria. Assessment of housing needs and demands. Housing market analysis and related studies, housing Finance Planning and Design criteria for housing forms and standards, housing densities, locations and Layouts Services and Community Facilities, Appraisal of existing housing options in Nigeria, private housing , cooperative housing and public housing. The concept of flexible controls and community guidance, spontaneous and squatter housing in Nigeria. Experience in housing selected developing countries, appraisal of official housing programmes in Nigeria through presentation of detail case study revealing its design, planning, finance, construction and management aspect. Highlighting problems and prospects.

URP 709: URBAN ECONOMICS

Measurement of economies activity levels in terms of products, income and employment product and income accounts, changes in economic structure and spatial ,patterns related with activities. Theories of economic development and their relevance at national, regional and settlement level in Nigeria e.g. stage theory, Export base Theory, Dynamic Growth theory, Regional Multipliers, Growth Pole theory, unbalance Growth Theory, theory of circular and Cumulative Causative and hypothesis of swash effects, models of Economic development and their applications in Nigeria context Growth of regions, trends in economic structure and factors leading to tertiarisation. Nature, causes and physical manifestation of poverty, characteristics and structure of rural economic problems. Priorities in rural development and strategies for development. Determinants of size and structure of urban size distribution.

URP 710: ENVIRONMENTAL ENGINEERING (Public Utilities)

Design and management of sewers, treatment, disposal and management of sewage. The management of solid waste, collection and disposal, Public health Laws, environmental issues, Case studies from Nigeria.

URP 711: PLANNING AND COMP UTER APPLICATION

History and development of computer, their relevance of computing technology tom physical planning, hard ware and software description. Computer-aided designs in planning. Introduction to computer hardware and software. Data processing and data coding, data analysis and statistical computing. Information processing, keying in of information, debugging, deleting and insertion, sample, programmes, practical exercises will be chosen to illustrate basic concept and use of computers. Further details on minicomputer and micro computer, handling SPSS (Statistical Package for Social Scientists) introduction to computer graphic computer aided Designs.

URP 712: COSTAL MANAGEMENT AND PLANNING

Definition of coastal area, Characteristics of coastal areas. The concept of coastal planning, the concept of coastal management. Coastal management issues - Population growth, Coastal use (sea port, barges, canals and jetties, impact of human use). Concept of Coastal planning and management. Theoretical basis of planning - rational planning, Incremental planning theory, Transactive planning, Adaptive planning, Responsive and radical planning theory. Peculiarities of Coastal areas. Ecological concept. Resources and conservation. Land Reclamation. Major costal management and planning techniques. Examination of both traditional and modern running techniques, administrative, social, technical. Coastal management in Nigeria, existing institutions, Problems and prospect - oil and gas exploitation and associate problems. Examination of the activities of the Niger-Delta Development Commission.

URP 713: APPLICATION OF GIS TO URBAN AND REGIONAL PLANNING

Definition of GIS. Functional element of GIS. Development of GIS. The geographical database, data Structure, Raster and Vector, Data acquisition, Data source, GIS / Remote Sensing Inter face, pre–processing and data input. Data management, basic principle and data base management systems. Data manipulation and analysis. GIS analysis functions. Practical case analysis and demonstration.

URP 714: TOURISM AND RECREATION PLANNING

The meaning of tourism and regional / national development element of tourism. Historical development of tourism in Nigeria. Potential and functional tourism in Nigeria. Management and organization of tourism and related activities. Impacts of tourism on the national economy.

Development of tourist resource centre, design and implementation consideration. Definition of recreation and Assessment of supply and Denman for recreational resources. Recreation planning studies. The nature scope and strategies for recreation planning. Urban indoor and outdoor recreation, countryside recreation resources development and management. National, regional and local parks. Forest recreation. Management of recreation resources.

URP 715: HISTORY AND EVOLUTION OF PLANNING THOUGHT

The history and evolution of urban and regional planning thought in Europe, America and Africa. Planning as a distinct activity. Influence of 19th and 20th century concepts on modern urban and regional planning. The changing role of the planner and case studies of the planning process. spatial inequalities development planning, etc.

URP 716: URBAN RENEWAL

Comprehensive redevelopment. Factors and criteria for delimiting unit area. Site investigation and renewal strategies - total, cellular, selective infrastructure, upgrading, etc. Data collection analysis and design of alternative proposal based on different strategies. Urban renewal, property assessment procedures and compensation. Decrees 88 and urban renewal process. Renewal of central areas, methodology of central areas demarcation detailed study and design. Judicial power government in urban renewal matters. Community participation in Urban renewal with examples from both developed and developing countries. Urban renewal finance. Criticisms levelled against urban renewal and planning tools.

URP 717: POPULATION AND URBANISATION STUDIES

The nature, trends and patterns of urbanization in developing countries, classical models of urban spatial structure and factorial ecology. The city as a system and mathematical modelling of urban system. Planning standards and subdivision control, land policies/ownership patterns, land use estimation and projection methods.

URP 721: PLANNING STUDIO III

The purpose of the studio exercise e the practical application of principle and techniques of Regional Development Planning in selected planning region. It involves - Delimiting the region and studying its development problems, Identification and explanation of the aims and objectives of regional planning, Identification of survey methods and data collection, and Identification and evaluation of plans for a region or sub region.

URP 722: PLANNING PRACTICE

Law relating to plan preparation and such other legal provisions. Preparation of planning briefs, Tender

documents, Structure of the fees as prescribed by Government and Nigeria Institute of Town Planners. Planners from various types of professional services, code of conduct as prescribed by NITP / TOPREC. Role of NITP and TOPREC in promoting the planning profession in Nigeria, basic principle and techniques of managing a technical office- both private and public, initiation of a project preparation and submission of preliminary outline for the proposed project. Selection of project team. Various notifications before commencing the project. Approval of competent authorities, Planning Office procedures, Contract terms and condition and agreement, Code of professional conduct and business ethics.

URP 723: PLANNING SEMINARS ON CONTEMPORARY ISSUUES

Presentation of seminars on approved topic selected by the various student – exposure to the modalities for reaction to feeling on planning research presentations. Development of academic professional skills in preparation and development of seminar papers.

URP 724: ENVIRONMENTAL PLANNING AND MANAGEMENT (EPM)

History and origin of environmental planning and management. Paradigms and urban management strategies, Concepts and workability of the EPM. Paradigm shift and basic outline of the EPM. Sustainable Cities Programme (SCP). challenge and dynamics of the EPM.

URP 725: PROJECT PLANNING, EVALUATRION AND FINANCING

The role of project in the wider context of urban, regional and national planning. Various technical, operational, financial and economic considerations crucial to project formulation and associated problems faced by planners. Techniques and method of project planning and evaluation. Project identification principles and public profitability, Project appraisal using such methods as Pay-back methods, Discount cash flow methods, Yield (Rate of Return) methods, Cash cost, etc. Project financing aspects of the course include Project selection and investment programming, feasibility study and report writing, sensibility analysis, choice of discount rate and cost capital. Analysis of financial conditions, risk and profitability approaches to risk/capital management. Others are Economic base of cities, municipal and local government authorities to invest in project, Fiscal planning programme, budgeting and financial planning choices, efficiency analysis, Equity implication of investment decision, Harmonization between investment decisions and physical development planning and implementation.

URP 726: RESEARCH TECHNIQUES AND METHODOLOGY IN PLANNING

The need for and purpose of research. identification and definition of planning problems, Some of information in planning; different research methods; Designing planning research; Techniques of measurement and classification; Attributes of planning research problems. Meaning and formulation of hypothesis, Analysis and writing of research reports and documentation.

URP 727: RESOURCE PLANNING AND DEVELOPMENT

Environmental Determinism, probabilism and possibilism. Natural resource studies, stock and inventory or resources linkages. Technology and natural resources. Natural resources estimation procedures. Natural resources and economic growth. The concept of environmental and intergenerational resources equity. The world resources and population dilemma, Agenda 21, biodiversity, resources conservation and management issues, Environmental sustainability.

URP 728: REGIONAL ANALYSIS

The city as a system, Central place system and rank –sized relationship, The nature of regions, classical models, factorial ecology and micro-economic explanation of Urban and regional spatial structure, mathematical Advance treatment of central place systems. Von Thunen and Weberian location system, Location system, optimum partitioning of point set, the maximal covering problem. Industrial location theories and models; role of industrialization in development. Typology of industrial regions. Case studies of regional practice in both developed and developing countries, socialist and capitalist countries. Approaches to regional planning.

URP 729: SITE SELECTION

Definition of site selection. Factors to be considered in selecting a site to serve a given objectives and functional need. Site analysis. Investigation and analysis of a site - its topography, soil condition, ground water table, vegetation, microclimate and district features, the site plan, its scale and contents. Circulation and utility network. Site engineering, building lines, Setback line, frontage plot coverage, and design standards.

URP 730: ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Approaches to assessment of the impact of physical and socio-economic development project on environment. Justification of EIA measures, needs for policies on environmental protection, History of legislation on Environmental ImpactAssessment in Nigeria, Problems and Prospect of EIA, Nuisance abatement and performance standards, Standard procedures and format for preparation and presentation of Environmental Impact Statement, Environmental Impact Studies; experience in U.S.A, U.K. and others, Relevant socioeconomic issues emerging from current practice in Nigeria and other developing countries in relation to the implementation of developing plans and application of EIA

URP 733: RURAL PLANNING AND DEVELOPMENT

The village as an organic entity. Rural-urban relationship, Contemporary functions. Of rural areas to urban areas. The rural -urban continuum, physical, social, and economic structure of a village. Problems of migration, village communities in Nigeria; their types and structure. Rural planning in relation to national and regional policies. Base principles of community development community development in relation too rural planning and housing self help techniques; role of voluntary organizations in community development, delineation of rural area for planning purpose, Rural settlement form, structure and function in different culture zones of Nigeria (with case studies in various major zones) factor affecting the site and location of rural settlements, village planning principles, institution basis for planning rural settlement, village regrouping, model, village planning and resettlement planning (with local examples).

URP 735: RESETTLEMENT PLANNING

The concept of resettlement. The social economic, administrative, psychological and political, issues in resettlement planning and executing of resettlement planning and executing of resettlement procedures. Case studies of resettlement to Kanji, Abuja FCT, etc. Land design, claims and legal aspect of resettlement, project execution, compensation, procedures and options.

URP 799: DISSERTATION/ PROJECT

This is an independent research project that must make substantial contribution to knowledge. Each student is required to prepare a dissertation on the topic of his / her choice as approved by the department. He / she defend the same at the end of the course before a jury of examiner appointed by the department. The dissertation is to provide an opportunity for each student to undertake an in-depth and original study and research in the field of interest. The dissertation also provides an opportunity to synthesize the knowledge and skills acquired through the learning of various theories and practice during the course. Each student will prepare the dissertation under the guidance of advisor appointed by the department. The dissertation should be neatly presented in the form of drawings, sketches, photographs and models , etc. and supplemented by a well- illustrated and comprehensive report of not less than 5,000 words.

B. Master of Technology (M.Tech) Programme in Urban and Regional Planning

1.0 Philosophy and Objectives

The M.Tech (Urban and Regional Planning) programme offers an educational opportunity designed to meet the specific needs of graduates of Social Sciences and other approved related disciplines in becoming professional town planner as well as providing advance education qualification to register Town Planner at postgraduate degree level. The curriculum **for the programme focuses on providing the basic conceptual knowledge and analytical skills required to provide feasible solution to problems confronting our environment. It is both** academic and a professional postgraduate degree programme designed to qualify its holder to become corporate members of the Nigerian Institute of Town Planners (NITP) and be able to register as Town Planner, with the Town Planner Registration Council of Nigeria (TOPREC).This is after the 2-year post qualification experience and passing the prescribed professional qualification examinations. The Department of Urban and Regional planning is housed within the school of Environmental Technology.

The content and structure of the programme prepare the students for the various professional challenges that lie ahead of them. The students are prepared both for rigorous academic and intellectual demands that the unit environment is known for. The department has a full complement of qualified, topflight practitioners made up of nineteen full-time academic staff. Nine of these are fully registered with the Nigeria institute of Town planners (NITP) and fifteen with the Town planners Registration Council of Nigeria (TOPREC). The Department has facilities such as designed studios, library, computer centre and other planning education paraphernalia.

The objectives of the programme are:

1 To produce a pool of professional graduates of Urban and Regional Planning capable of handling planning policy matters at national, regional and local levels.

2 To provide opportunity to social sciences graduates of related professional discipline to train as professional town planner.

3 To provide higher calibre graduates who can provoke intellectual debates and evolves theoretical philosophical concepts for the expansion of frontier of knowledge in Urban and Regional planning

2.0 Admission Requirements

Applicant for the M.Tech (Urban and Regional Planning) programme in addition to satisfying the general University regulations for admission should posses any of the following qualifications:

(i) B.Tech degree in Urban and Regional Planning with at least second class honours of the Federal University of Technology. Akure or its equivalent from other recognized Universities.

(ii) B.Sc degree with a minimum of second class honours in Social Sciences of approved related disciplines

(iii) Postgraduate Diploma in Urban and Regional Planning with at least Upper Credit grade.

3.0 Duration of Programmes:

The M.Tech (Urban and Regional Planning) runs for minimum of 18 months. It is based on course unit system where the number of contact hour is paramount as the deciding factors

4.0 Requirements for Graduation:

Student shall be evaluated using examination and course work assessment. In every semester, two examinations are conducted these are the mid-semester examination and the final semester examination that covers the entire syllabus on the course in the semester. There is also a continuous assessment which takes different forms such as term paper, short test, and seminar papers, etc.

In the case of studio design work, a life project is selected which normally allows the student to face the reality on the field. A mid jury is conducted on every design project. Planning practitioners are invited to form part of the assessors for the final jury. Due to inconsistency in the duration of the academic session as a result of unpredictable incessant strikes by universities labour union, the3-month inters hip initially slated for the vacation after the first academic session into the programme, has been shifted to the fourth semester which was initially designed only for the conduct of the independent research work on the M.Tech dissertation.

During the conduct of the research, students are expected to present three seminar papers (proposal seminar, pre-survey seminar and post survey seminar). Students shall defend the M.Tech dissertation before a panel of examiners constituted by the Examination Board of the postgraduate school, headed by an external examiner, who should be a seasoned academia and registered Town Planner

Apart from satisfying other University regulations, the student must have successfully presented three(3) seminars – project proposal, project progress report, and end of project report (i.e. post-survey report) at the School of Environmental Technology, Postgraduate Seminar before the final thesis defence (oral examination). A thesis describing the original work carried out while studying for the degree and written in the format specified by the School of Postgraduate Studies must be submitted at the end of the programme. After submission of the thesis, the candidate will be examined orally by a Panel of Examiners according to the regulations of the Postgraduate.

COURSE OUTLINE:

M.Tech I First Semester Core Courses

Course Code	Course Title	L	T	P	U
URP 801	Principles of Urban Planning	2	1	0	3
URP 803	Housing	2	1	0	3
URP 805	Planning Studio I Basic Design Studio	0	0	9	3
URP 807	Environmental Engineering	2	0	3	3
URP 809	Transportation Planning	2	0	3	3
URP 813	Population and Urbanisation Studies	2	0	3	3
	Total	**10**	**3**	**15**	**18**

Electives (select one)

Course Code	Course Title	L	T	P	U
URP 815	History of Urban and Regional Planning	2	1	0	3
URP 817	Natural Resources Planning and Development	2	1	0	3
URP 819	Site Selection and Planning	2	0	3	3
	Total				**21**

M.Tech I Second Semester Core

Course Code	Course Title	L	T	P	U
URP 802	Principles of Regional Development Planning	2	1	0	3
URP 804	Theory and Philosophy of Planning	2	1	0	3
URP 806	Research and Quantitative Techniques in Planning	2	0	3	3
URP 808	Project Planning and Evaluation	2	0	3	3
URP 810	Planning Studio II	0	0	9	3
URP 812	Planning and Computer Technology	2	0	3	3
URP 814	Coastal Management and Planning	2	0	3	3
	Total	**12**	**2**	**21**	**21**

Electives (Select one)

URP 816	Rural Settlement Planning	2	0	3	3
URP 818	Urban Analysis	2	1	0	3
URP 820	Housing Development Process	2	1	0	3

M.Tech II First Semester Core

Course Code	Course Title	L	T	P	U
URP 821	Application of Geographical Information System to Urban and Regional Planning	2	1	3	3
URP 823	Planning Law and Administration	2		0	3
URP 825	Advanced Studio Design (Planning Studio iii) Regional Plan Making	0	0	9	3
URP 827	Environmental Impact Analysis	2	0	3	3
URP 829	Professional Practice And Ethics	2	1	0	3
URP 831	Independent Work On Nigeria Problem Seminar	1	3	0	3
	Total				**18**

Electives (Select one)

Course Code	Course Title	L	T	P	U
URP 833	Tourism and Recreation Planning	2	0	3	3
URP 835	Urban Renewal Techniques	2	0	3	3
URP 837	Landscape Planning and Design	2	0	3	3
URP 839	Public Transportation planning and Administration	2	0	3	3
	Total				**21**

M.TECH II SECOND SEMESTER

Course Code	Course Title	L	T	P	U
URP 899	Master'sThesis Research Project	0	0	36	12
URP844	Internship	0	0	9	3

COURSE SYNOPSES

URP 801: PRINCIPLE OF URBAN PLANNING

Classical theories models of urban structure and growth. The fundamental components of urban space and areas viz Residential, commercial, Recreational, Circulation, Public use, and open spaces. The core-periphery relationship and urban transportation. Location criteria and allocation standard for urban land use element, Introductions to population dynamics and growth urban employment planning and facilities. The concept of Great city/Twin city.

URP 802: PRINCIPLES OF REGIONAL DEVELOPMENT PLANNING

The concept of a region - formal, functional and planning region. The central Place Theory, its application to the sub region space in Nigeria. Theories of regional development; Growth pole, point, centre, core-periphery, and its variation. Traditional and modern regional development strategies especially in developing countries.

URP 803: HOUSING ANALYSES AND POLICY

The universality of housing problems, housing market analysis, housing demand and supply concept. Situations in selected European countries like Russian. Britain, France, USA are considered. The assessment of housing needs, housing and national Economy. Housing as subsystem in the urban system, housing and urban Renewal, Housing programmes in developed and developing economics, housing finance instrument and intermediation.

URP 804: PHILOSOPHY AND THEORY OF PLANNING

The nature of planning philosophy in relation to methodology, techniques and designs. Procedural and Substantive Planning Theories, Comprehensive Planning, Incremental Planning, Advocate planning, System planning, etc. The Traditional Planning Process, Master Planning, Structure Planning, Local planning philosophy, traditional capitalist and socialist economics, Citizen Participation and Community involvement in the planning process. The relationship between physical and economic planning

.

URP 805: PLANNING STUDIO I

The concept of minimum and desirable space allocation standards, visual elements, in urban Complex. Design resource Composition, Space articulation and aesthetic

qualities. Selected site planning and design project for residential, agricultural commercial, recreation, commercial transportation and public land use. Students are required to hold a design portfolio of substantial site plans and drawings of good quality at the end of the course. Application of Computer Aided Design (CAD) to Neighbourhood or Estate Design in Urban & Regional Planning.

URP 806: RESEARCH AND QUANTITATIVE TECHNIQUES IN PLANNING

Formulation of Research problems focus and justification. Formulation and test of research hypothesis, Sources and importance of data for planning, Data availability and initiatives. Survey of literature Techniques. Social survey methods, Observation, Interview, Questionnaire. Sampling procedures: target population sampling frame size and techniques survey administration, cost and time scheduling. Data collection, data coding, data analysis, storage and retrieval. Use of parametric and non-parametric, measures dependent and independent variables of research, multivariate Techniques.

URP 807: ENVIRONMENTAL ENGINEERING

Design standard criteria for public utilities and infrastructure Networks. Water Supply, Sources, Treatment and Distribution, Electricity Generation, Transmission, Substation and Distribution. Design and Management of sewer. Sewage Generation, Conveyance, Treatment methods and Effluent Disposal. Solid Waste collection and Disposal. Environmental pollution and degradation in cities Public Health laws and management in Nigeria.

URP 808: PROJECT PLANNING AND EVALUATION

Identification and formulation of a project,Analysis of a project, definition of a project, private and public profitability, project Appraisal techniques; D.C.F. and D.R.F analysis and measures of profitability. Need for cost benefit analysis, social objectives and notion of accounting pricing. Applicability of cost-benefit analysis in Nigeria. Standard presentation of cost- benefit analysis. Project evaluation, project choice and design. decentralized evaluation. Selection of project and investment programme, feasibility study and report, Sensitivity analysis - its uses and mis-uses. Uncertainty - varieties and description, investment decision under uncertainty.

URP 809: TRANSPORTATION PLANNING

Transportation and land use connection. Population distribution and Economic activities in relation to transportation, Traffic generation distribution, modal split and Assignment Method of traffic forecasting, Origin and Destination Surveys Factors of Road alignment; designs speed, design volume and concentration, Sight Distance, lanes and carriage ways, transportation financing and Administration. Road Safety Regulations in Nigeria.

URP 810: INTERMEDIATE DESIGN STUDIOS (PLANNING STUDIO II)

Procurement of sites, site survey and base maps. Site visit, preliminary assessment and charting of recent development site upgrading. Road and Reticulation system. Location of technical and social Infrastructures. Plot subdivision block and plot numbering, colouring. Technical report writing. Oral presentation of a comprehensive master plan or Newtown for selected sites. Block models of selected presentations.

URP 812: PLANNING AND COMPUTER TECHNOLOGY

The relevance of computing technology to Physical Planning. Computer-Aided Design in Planning. Introduction to traditional programming packages and languages like COBOL, FOTRAN, etc. Data coding and data processing procedures. Data Analysis: Use of some packages like S- plus, SPSS, Minitab, etc. Statistical Computing, pictorial output, data structures. Practical exercises will be chosen to illustrate basic concepts and uses of computer.

URP 813: POPULATION AND URBANIZATION STUDIES

Introduction to Population and Demographic Studies. Population characteristics, sex, age, occupation, population pyramidal Structure in developed and Developing Countries population dynamics, crude birth and rates, age specific, birth and death rates, cohort models, population forecasting methodologies, The nature treads and pattern of mechanization in developing countries with specific references to Africa and Nigeria . Factors of Urbanization in developing countries, Migration studies, The world population trends, future population explosion and dilemma.

URP 814: COASTAL MANAGEMENT AND PLANNING

Definition of coastal areas; characteristic of coastal areas. Coastal management issues. The need for coastal planning population growth. Coastal use - Resource exploitation (fisheries, forestry, gas, oil). Infrastructure - transportation, ports, harbour, shorelines protection works and defence. Tourism and recreation. Conservation and reserve and protection of biodiversity. Impact of human use - pollution, industrial sewage and run/off. Coastal hazards and climatic change. Administrative issues. The concept of coastal planning. The concept of coastal management. Placing emphasis on integration. Major coastal management planning techniques Administrative - Policy and legislation, guideline, zoning, regulation and enforcement Social. Customary (traditional) practice. Collaborative and community-base management. Capacity building. Recreation and tourism management. Environmental Impact Assessment (EIA) of Coastal Project. The need for EIA. Steps in the EIA process, Operational EIA, integration of EIA with planning. Risk and hazard assessment and management of Coastal areas. Landscape and visual resource analysis. EconomicAnalysis.

URP 815: HISTORY OF URBAN AND REGIONAL PLANNING

This historical evolution of Town and country planning in Europe, America and Nigeria as a caser study. Survey of human settlement and their spatial forms from the medieval period to the present. Comprehensive assessment of present third world settlement and those of the industrialized countries before the 1st world war, 19th and 20th century thought and concept of modern planning , spatial inequalities and evolution of region and national development planning. The evolution of regional development theories and instrument. History of Urbanization in Nigeria.

URP 816: RURAL SETTLEMENT PLANNING

Identification of rural settlement problems, uses, spatial, social and technological. Village survey - forms and facilities and characteristic studies. Policy, principles and strategies in Nigeria ADP, Farm settlement, River Basin Authorities, Better Life, DFFRI etc.

URP 817: NATURAL RESOURCES PLANNING AND DEVELOPMENT

Environmental Determinism, Probabilities and Possibilism, Natural resources studies, stock inventory, sources, linkages, Technology and Natural Resources. Natural resources estimation procedures, Natural resources and Economic growth. The Concept of environmental and Intergeneration resources equity. The world resources and population dilemma, Agenda 21, Biodiversity, Resources Conservation and Management issues, Environmental sustainability.

URP 818: URBAN ANALYSIS

The nature of cities, classical models of urban spatial structure and factory ecology. The analysis of urban population densities and ecological succession. Relevant economic theories to guide growth e.g. Stage theory, export Base theory, sector Theory, aggregate growth models. Core-periphery models, Growth Pole theory,Circulation, cumulative causation models, Social area Analysis. Central place theory, rank size Rule and Urban privacy. Economic Base studies, Retail and trading Market function. City delineation. City as a system within cities. City ageing, gentrification and renewal system.

URP 819: SITE SELECTIONS AND PLANNING

Site analysis and investigation, Site vegetal cover micro-climate, soil condition and capacity, ground water geological structure and mineralogical composition. Comprehensive geographical information system. The role of Aerial photographs and information. Factor, criteria and standard for site selection for functional activities. Site plane scale, circulation and utility networks, Design standards for building lines Setback and plot coverage.

URP 820: HOUSING POLICY AND DEVELOPMENT Housing within the context of National Development planning. Housing policy in Britain, USA and China. Housing problems, need and demand and supply in Nigeria. Housing finance, Institution, Instrument and Innovations in Nigeria. Innovative strategies for housing in developing countries. Housing policy and programme in Nigeria pre and post independence. The 1991 housing policy in Nigeria. Fringe housing, upgrading and housing project for low-income groups.

URP821: APPLICATION OF GIS TO URBAN AND REGIONAL PLANNING

What is GIS? Functions and elements of GIS. Development of GIS. The geographical Database, Data structure, Raster and vector, data acquisition, Data source, GIs /Remote Sensing interface, Pre-processing and data Input. Data management, Basic Principle and base management system. Data manipulation and analysis. GIS analysis function. Trends of output products. GIS projects design and execution.

URP 823: PLANNING LAW AND ADMINISTRATION

Introduction to the Nigeria legal system: Judicial Structure. The purpose and basic principle for legislation in planning in USA, UK and Nigeria. Detailed study of Health code, planning legislation and building code in U.K.and Nigeria. The act of planning, review and approval. Process of land-use planning. Laws on compensation and compulsory acquisition with special reference to Nigeria. Judicial case of settled land related conflict in Nigeria. The enforcement of developing control zoning laws and regulation. The 1992 Urban and Regional planning ,laws as it affects planning in Federal, State and Local Level. Local government reform in Nigeria and Effects on Urban Planning. National Environmental Protection agency Acts and Laws and their relevance to the planning process. The current trends in Planning Laws in the study.

URP 825: ADVANCE DESIGN STUDIO (PLANNING STUDIO III)

The basic project for the course shall be the design or regional plans; Collection, Collation and study materials for existing situation in the region of study; Preliminary situation visit to relevant sites in the study area; Design and administration of research instrument to collect socio- economic data; Data Processing and Analysis; Costing and implementation criteria and report writing.

URP 827: ENVIRONMENTAL IMPACT ASSESSMENT

Environmental Possibilism and determinism. Definitions and significance and scope of ecology. Examination of the analysis for Environmental Impact Assessment studies. Environmental quality standards. Pollution control. Environmental Protection Feasibility studies. Institutional and Intergovernmental Arrangements. Monitoring and Evaluation. The Relevance of EPA Decree 86 in Nigeria.

URP 829: PROFESSIONAL PRACTICE AND ETHICS

The roles of the planner in government and private sector. The emergence, organization, and function of the Nigeria Institute of Town planner (NITP). The Town Planning Registration Council of Nigeria (TOPREC) Law. The relationship of NITP to sister professional bodies. The organization of planning office. The planning consortium, conditions and agreements. Preparation of planning briefs, structure of professional fees, code of conduct and professional Ethics. Procedures for project team selection, stages of project approval and verification and Project assessment by client authorities. Politics and Planning in Nigeria.

URP 831: URBAN AND REGIONAL PLANNING SEMINARS

Each student is expected to select topics that deal with typical planning problems in Nigeria for research. The research must be original, well- researched and neatly packaged for oral presentation in planning seminar series. Oral presentation mid semester assessment.

URP 833: TOURISM AND RECREATION PLANNING

Definition of Tourism and Recreation. Estimating demand for tourism and recreation, Key factors. Historical and key tourist centre in Nigeria. Design and location of public recreation facilities. Problems and management issues of Recreational resources in Nigeria. Tourism and Recreational resources and characteristics. A visit to local tourist centres such as Ikogosi warm Spring, Oke Maria, idanre hills, etc will be organized. Student must present reports of such visitation.

URP 835: URBAN RENEWAL TECHNIQUES

Comprehensive re-development factors and criteria for delimiting unfit areas. Site investigation and renewal strategies, total, cellular, selective, infrastructure, upgrading, etc. Data collection analysis and design of alternative proposal based on different strategies. Urban renewal, property assessment procedures and compensation. Community participation issues ion the urban renewal process in Nigeria, renewal of central areas; Methodology of central demarcation, detailed study and design. Judicial powers of government in urban renewal matters. Public participation in Urban

Renewal in developed and developing countries. Urban renewal finance in developing and developed countries.

URP 837: LANDSCAPE PLANNING AND DESIGN

Relationship of landscape design and planning to town planning. Historical evolution of public parks and recreational areas. Introduction to landscape materials, construction techniques like land grading, Structural elements and plant. Landscape planning process, site inventory, analysis, design programmes, illustrative Landscape design. Practical Project of landscape planning to land use plan in order to secure a planned, ordered and attractive urban environment. Landscaping of central areas of Town and Cities. Urban design realities- use of voids in relation to circulation and amenities. Landscaping and city image in Nigeria.

URP 839: PUBLIC TRANSPORTATION PLANNING AND ADMINISTRATION

Public transport system - road, rail and water, administrative organization structure. Fare structure collection system. Inter change facilities. Demand and supply of public transport. Criteria for route in various land use, highway design and traffic management for road. Public transport, rural transport services, subsidies and other sources of revenue for public transport. Public transport in planning process. Legislation issues.

URP 844: INTERNSHIP

Attachment to a planning agency under the supervision of registered and practicing planners. It is a 3-month attachment with periodical visitation by supervising lecturers. A report is expected to be presented at the end of the training by the student.

URP 899: MASTER'S THESIS RESEARCH PROJECT (12 UNITS)

An independent research project that must make substantial contributions to knowledge in general and professional of Urban and Regional Planning in particular. During the course of conduct the research each student is expected to represent three seminars on the research of the student is expected to present three seminars on the research study. These are proposal Seminars, Pre-survey Seminars and Post-survey seminar. The dissertation prepared would be defended before the PG Board constituted examination for the department.

DOCTOR OF PHILOSOPHY (Ph.D) PROGRAMME IN URBAN AND REGIONAL PLANNING

1.0 Programme Philosophy

The Doctor of Philosophy (Ph.D) degree in Urban and Regional Planning is purely by research geared towards preparing students for advanced research and academic career in applied Urban and Regional Planning. The Ph.D would be awarded on the basis of a thesis that represents the outcome of a research, relevant to the principles and Practice of Urban and Regional Planning. The programme will also embrace a specially designed programme of research training through regular staff/postgraduate seminars efforts of students and staff are discussed.

LIST OF ACADEMIC STAFF IN URBAN AND REGIONAL PLANNING DEPARTMENT (URP)

S/N	Name	Qualification	Status	Area of Specialisation
1	BASORUN, Joseph Omoniyi	PhD (URP), MURP, PGD (URP), B.Sc. (Env. Sc. & Res. Mgt.)	Professor	Regional Development Planning; Environmental Resources Management
2	FASAKIN, Julius Olubunmi	PhD (URP), MURP (Ibadan), BSc. (Pol.Sc.)	Professor	Transportation & Housing Studies
3	AKINBAMIJO, Olumuyiwa Bayo	PhD (URP), MURP, B.Sc. Geog	Professor	Environmental Management
4	OMOLE, Felix Kayode	PhD (URP), M. Sc. (URP), B.Sc. (Geo. &Reg. Plg),	Professor	Regional Analysis, Housing Development
5	OLAJUYIGBE, Ayo Emmanuel	PhD (URP), MURP, Dip (Enschede), B.Sc.(Geog)	Professor	Infrastructure Planning and Management. Coastal Planning and Management
6	OYINLOYE, Michael Ajide	PhD (URP), M.SC (Geog & Plg), PGD (Computer Sc.), B.Sc. (Geog.)	Professor	Land use Management, GIS and Remote Sensing
7	EMMANUEL, Adebayo Adewumi	PhD (URP), M.Tech (URP), B.Tech (URP)	Professor	Land Economic Development, Tourism/Recreation
8	ROTOWA, Olukayode Olawumi	PhD (URP), M.Tech (URP), B. Sc (Geog.)	Professor	Environmental Planning& Infrastructure Management
9	ALABI, Michael Oloyede	PhD (URP), M.Sc (URP), B.Sc (Geog.)	Professor	Urban Land use change& Eco-environmental Management
10	OLUSA, Adekemi Opeyemi	PhD (URP), M.Sc (URP), B. Tech (URP)	Professor	Infrastructure Planning & Environmental Planning & Management
11	POPOOLA, Olusola Olalekan	PhD (Marine Studies-Plymouth, UK), M.Sc (URP), B.Tech (URP),	Reader	Environmental Modelling and Management. Coastal & Marine Planning
12	ENISAN, Olugbenga Franklin	PhD (URP), M.Tech. (URP), B.Sc. (URP)	Reader	Land use Planning, Housing and Urban Development
13	OWOEYE, Julius Oluranti	PhD (URP), M.Tech (URP), PGD (Ife), B.Sc (Geog.),	Reader	Urban Studies, Land Use Planning and Environmental Management
14	OWOLABI, Babatunde Oluwaseyi	PhD (URP), M.Sc (URP), B.Tech (URP)	Senior Lecturer	Housing, Transportation Planning
15	ADEYEMI, Adeboye George	PhD (URP), M.Tech (URP), B.Tech (URP)	Senior Lecturer	Housing, Regional Development and Transportation Planning
16	AKINBODE, Temitope	PhD (URP), M.Tech (URP), B.Sc (Geog & Reg Planning)	Senior Lecturer	Environmental Management and Sustainable Development
17	ALUKO, Eniola Agnes	PhD (URP), M.Tech (URP), B.Tech (URP)	Senior Lecturer	Infrastructure Planning and Sustainable Development
18	OLANIBI, Julius Adekunle	PhD (URP), M.Tech (URP), B. Tech (URP)	Lecturer II	Coastal Planning and Environmental Management
19	OLAMIJU, Isaac Oluwadare	HND, PGD, M.Tech., PhD (Akure)	Lecturer II	GIS and Infrastructural Planning

9.7 SCHOOL OF INFRASTRUCTURE, MINERALS AND MANUFACTURING ENGINEERING

9.7.1 DEPARTMENT OF AGRICULTURAL AND ENVIRONMENTAL ENGINEERING (AEE)

1. **Department:** Agricultural and Environmental Engineering

2. **Postgraduate programmes offered:**
   a) M.Eng.
   b) Ph.D.
   c) PGD

3. **Available options:**

a) M.Eng.:
i. Agricultural Power and Machinery System
ii. Soil and Water Resources Engineering
iii. Agricultural Structures and Environmental Controls
iv. Bioresources and Food Process Engineering
v. Renewable/Alternative Energy

b) Ph.D.:
a. Agricultural Power and Machinery System
b. Soil and Water Resources Engineering
c. Agricultural Structures and Environmental Controls
d. Bioresources and Food Process Engineering
e. Alternative/Renewable Energy

4. **Philosophy and objectives:**

a) M. Eng:
In order to have an in-depth knowledge of the basic principles underlying the body of knowledge, candidates are trained for the award of M.Eng. degree in Agricultural Engineering. Such candidates are trained to develop a broad analytical mind that would enhance major intellectual and technological breakthroughs to improve agricultural production. Furthermore, the M.Eng. degree is offered such that the students are adequately versed in their discipline and be competent in imparting the knowledge to others in a conducive academic environment to ensure the continued existence of the system.

b) Ph.D:

Ph.D. candidates are trained to develop a broad analytical mind that would enhance major intellectual and technological breakthroughs to improve agricultural production. Furthermore, the Ph.D. degree is offered such that the students are adequately versed in their discipline and be competent in imparting the knowledge to others in a conducive academic environment to ensure the continued existence of the system.

5 Admission Requirements:

a) M. Eng:

The admission requirements include:
i. Degree in Agricultural Engineering or related discipline with at least Second Class.
ii. PGD in Agricultural Engineering with at least Upper Credit pass.
iii. M.Eng. or M.Sc. in any engineering discipline with average score of 60%
iv. All candidates must have credits in at least five O'Level subjects at not more than two attempts including English, Mathematics, Physics, Chemistry, Biology or Agric. Science.

b) Ph.D.:

The admission requirements include:
i. M. Eng or M. Sc in Agricultural/Agricultural and Biosystem/ Agricultural and Bioresource/Agricultural and Food and other related discipline with a minimum score of 60%
ii. Degree in Agricultural Engineering or related discipline with at least Second Class.
ii. PGD in Agricultural Engineering with at least Upper Credit pass.
iii. M.Eng. or M.Sc. in any engineering discipline with average score of 60%
v. All candidates must have credits in at least five O'Level subjects at not more than two attempts including English, Mathematics, Physics, Chemistry, Biology or Agric. Science.

6. Duration of Programme:

a) M. Eng
A minimum of one academics session (2 Semesters) is required for the full time M. Eng programme, including course work and project.

b) Ph.D:
A **minimum** of three academic sessions (6 semesters) is required for a full – time PhD candidate, while a minimum of five academic sessions (10 semesters) is required for a part – time candidate.

7. Requirements for Graduation:

a) M. Eng:

Candidates for the award of M.Eng. degree in gricultural Engineering must satisfy the following requirements:

i. Pass all prescribed courses offered in both first and second semesters;
ii. Conduct a prescribed project work and submit the required number of copies of thesis for examination.
iii. Perform satisfactorily during the Oral examination (viva) of his thesis,
iv. Revise and submit the required number of copies of the thesis after examination; and
v. Present a seminar on his or her project work on completion, and before the viva.

b) Ph.D.:

Candidates for the award of Ph.D. degree in gricultural Engineering must satisfy the following requirements:

i. Pass all prescribed courses offered in the first session;
ii. Conduct a prescribed research work and submit the required number of copies of thesis for examination.
iii. Perform satisfactorily during the Oral examination (viva) of his thesis,
iv. Revise and submit the required number of copies of the thesis after examination; and
vi. Present at least three seminars before the viva.

8. Course Outline:

a) M. Eng:

8.1 M.Eng (Agricultural Power and Machinery System Option)

First Semester

COURSE CODE	COURSE TITLE	L	P	UNITS
AGE 801	Research Methodology/Experimental Design &Analysis	2	-	3
AGE 803	Instrumentation and Control	2	3	3
AGE 805	Advanced Production Technology	2	3	3
AGE 807	Systems Engineering in Agriculture	2	-	3
AGE 811	Rheological properties of Agric. Materials	3	-	3
AGE 813	Advanced Agric. Machinery	2	3	3
AGE 899	Research Project	-	-	6
	Total			**24**

Second Semester

COURSE CODE	COURSE TITLE	L	P	UNITS
AGE 804	Soil-tillage dynamics	2	3	3
AGE 806	Energy Sources & Utilisation in Agric	2	3	3
AGE 808	Advanced Agric. Machinery & Equipment design	2	3	3
AGE 812	Tractor design	2	3	3
AGE 899	Research project	-	-	6

8.2. M.Eng. (Bioresources and Food Process Engineering Option)

1ST SEMESTER

S/N	Course Code	Course Title	L	P	Unit
1.	AGE 831	Principle and Theory of Grain Drying	2	3	3
2.	AGE 833	Advanced Thermodynamics	2	3	3
3.	AGE 835	Engineering Properties of Agric Materials	2	3	3
4.	AGE 837	Advanced Storage Technology	2	3	3
5.	AGE 801	Research Methodology/Experimental Design & Analyses of Experiments	2	-	3
6.	AGE 807	System Engineering in Agriculture	2	-	3
7.	AGE 839	Fish, Meat and Dairy Storage and Processing	2	3	3
8.	AGE 899	Research Project			6
		Total			**27**

2ND SEMESTER

S/N	Course Code	Course Title	L	P	Unit
1.	AGE 832	Heat and Mass Transfer	2	3	3
2.	AGE 834	Advanced Food Engineering	2	3	3
3.	AGE 836	Alternative Energy and Solar Application in Storage, Drying and Processing	2	3	3
4.	AGE 838	Material Handling Technology	2	3	3
5.	AGE 899	Research Project			6
		Total			**18**

8.3 M. Eng (Soil and Water Resources Engineering Option)

FIRST SEMESTER

S/N	Course Code	Course Title	L	P	Unit
1.	AGE 801	Research Methodology/Design & Analyses of Experiments	2	-	3
2.	AGE 803	Instrumentation and Control	2	3	3
3.	AGE 809	Systems Engineering and Agriculture	2	-	3
4.	AGE 821	Bioclimatology	3	-	3
5.	AGE 823	Irrigation and Irrigations Systems	2	3	3
6.	AGE 827	Advanced Drainage Systems	2	3	3
7.	AGE 891	Research Project	-	-	6
Total					**24**

2ND SEMESTER

S/N	Course Code	Course Title	L	P	Unit
1.	AGE 824	River and Canal Hydraulics	2	3	3
2.	AGE 826	Water Resources Engineering	2	3	3
3.	AGE 828	Groundwater Development	2	3	3
4.	AGE 830	Dams	2	3	3
5.	AGE 899	Research Project	-	-	6
		Total			**18**

8.4 M. Eng (Agricultural Structures and Environmental Control Option)

FIRST SEMESTER COURSES

S/N	Course Code	Course Title	L	P	Unit
1.	AGE 801	Research Methodology/Design & Analyses of Experiments.	2	-	3
2.	AGE 803	Instrumentation and control	2	3	3
3.	AGE 809	Systems Engineering in Agriculture	3	-	3
4.	AGE 841	Elements of Structural Analysis	3	-	3
5.	AGE 843	Engineering properties of materials of construction	2	3	3
6.	AGE 845	Farmstead planning and building environment	3	-	3
7.	AGE 899	Research Project			6
		Total			**24**

SECOND SEMESTER COURSES

S/N	Course Code	Course Title	L	P	Unit
1.	AGE 842	Elements of structural analysis II	3	-	3
2.	AGE 844	Building construction and surveying	2	3	3
3.	AGE 846	Buildings and environments for crop production	2	3	3
4.	AGE 848	Public Health Engineering	3	-	3
5.	AGE 840	Buildings and environments for animal production	2	3	3
6.	AGE 899	Research project	-	-	6
		Total			**24**

8.5 M. Eng (RENEWABLE/ALTERNATIVE ENERGY OPTION)

FIRST SEMESTER COURSES

S/N	Course Code	Course Title	L	P	Unit
1.	AGE 801	Research Methodology/Design & Analyses of Expts.	2	-	3
2.	AGE 803	Instrumentation and control	2	3	3
3.	AGE 807	Systems Engineering in Agriculture	3	-	3
4.	AGE 851	Renewable Energy Technologies I: Solar, Thermal and Electrical System	3	-	3
5.	AGE 853	Renewable Energy Technologies II: Wind, Tidal, Wave, and Hydro-electricity	2	3	3
6.	AGE 855	Renewable Energy Equipment Design	3	-	3
7.	AGE 899	Research Project			6
		Total			**24**

SECOND SEMESTER COURSES

S/N	Course Code	Course Title	L	P	Unit
1.	AGE 852	Advanced Heat and mass Transfer	3	-	3
2.	AGE 854	Renewable Energy Technologies III: Geothermal, Biomass and Hydrogen	2	3	3
3.	AGE 856	Energy Storage Technology	2	3	3
4.	AGE 858	Environmental Legislation: Energy and Environment Impact Assessment, Renewable energy Policy and Market	3	-	3
5.	AGE 899	Research project	-	-	6
		Total			**21**

b) Ph.D:

For candidate who do not possess an M.Eng. or M.Sc. in Agricultural Engineering or whose transcripts indicate deficiencies in some required courses, the Department shall prescribe some courses, which must be offered during the first year of the programme.

9. Course Synopsis:

AGE 801: Research Methodology/ Experimental Design & Analysis – 3 units

(a). *Research Methodology*

Objective and scope of research; Modelling; Model verification; Research procedure;

Time scheduling; and material selection and allocation; Collection of data; Laboratory and workshop investigations works-study; Preparatory of report; Studies of selected problems which illustrate various research techniques.

(b). *Experimental Design nalysis*

Statistical methods; Definition of statistical terms; The representation of numerical data; Measures of dispersion; Distributions: binomial, poisson, normal; Statistical significance: normal distribution test, and test; confidence limit and confidence interval, variance ratio test (f-test), least, significance difference (L.S.D.) test, X^2-test; Regression and correlation; Comparative experiments: design, replication, randomization, latin squares, balanced incomplete block designs; (office design)., Factional experiments: design, analysis, and determination of optimum conditions.

AGE 803: Instrumentation and Control - 3 units

Estimation of errors; Theory of basic instrumentation, transducers, and controllers; and application to agricultural engineering problems; Agricultural measurement systems: Soil, Water and humidity devices and instruments for quality evaluation and control of agric. products. Measurement of product maturity and ripeness; Inspection of graine and seeds, animal carcass, quality and milk fat analysis; Stress-strain measurement; Temperature measurement; Static and dynamic measurement.

AGE 05: Advanced Production Technology - 3 units

Production Planning and Control. Sheet metal fabrication by forming and stamping. Influence of material parameters on formability and die design. Techniques in moulding and casting. Fits and Tolerances. Metal Machining, machine - tools and instruments. Jigs and Fixtures Materials, equipment and processes for fabrication of plastics. Theory and applications of welding processes, factors affecting

weldability, consideration in the design of welded component. Workshop metrology. Equipment and planning in Agricultural machinery maintenance and service plants. Assembly operations. Advanced methods in production e.g. die-casting, Rolling, Extrusion, Wire Drawing, Forging etc.

AGE 807: Systems Engineering in Agriculture - 3 units
Systems definition and concept; Systems design process; Models and algorithms; Allocation of resources; Linear programming; Integer programming; Non-linear programming: separable and anadrotic programming; Dynamic programming; Transportation analysis; Locational analysis
Network analysis; Queuing theory; Replacement theory; Inventory theory; Simulation; Sensitivity analysis; Primal and dual formation; The above optimisation techniques are to be applied to mechanized agricultural production systems

AGE 811: Rheological Properties of Agric. Materials - 3 units
Importance of rheological properties in agriculture\; Classification of agricultural materials and identification of rheological properties; Principles of stress, deformation and flow; Vector and tensor equations of fluid mechanics; Behaviour of Newtonian, non-Newtonian and Visco-elastic fluids; Experimental determination of rheological properties using fundamental methods and empirical textural measurements; Treatments for modification of rheological properties.

AGE 813: Advanced Agricultural Machinery - 3 units
Review of common agric. Machinery; Farm implement controls; Fruit and vegetable harvesting; Forage harvesting machinery; Specialized harvesting machinery; Livestock production; machinery; Development in agricultural machinery; Selection of power units for mechanized agriculture; Agric. Machinery selection and utilisation analysis.

AGE 802: Advanced Storage and Processing Engineering - 3 units
Engineering principles involved in mechanical handling, conditioning and storage of agricultural products. Application of refrigeration, electric energy and physical properties of agricultural products. Heat and mass transfer applications for drying, dehydration and freezing. Design of equipment and facilities in storage buildings.

AGE 804: Soil-tillage Dynamics - 3 units
Dynamic properties of soil; Soil reactions to forces: retaining wall and bearing capacity theories; general soil mechanics equations; soil/soil shearing, soil/interface sliding, soil failure with tines, soil compaction, wheel and track performance in soil. Forces acting upon a tillage implement and their measurements; Mechanics of tillage; Tillage tool design factors; Measurement of hitch forces on mounted and semi-mounted implements; Mechanics of traction and transport; Tillage implement-tractor relationships; Tillage and cultivation practices.

AGE 806: Energy Sources and Utilisation in Agriculture - 3 units
Sources of energy; Problems of meeting the growing energy demand; technical, economic and political considerations engineers balance in selecting and energy source, advantages and disadvantages of each energy source. Overview of energy uses, resources, energy conversion, technology and environmental problems, current and future energy systems: nuclear, fosil fuel, geothermal, solar and others. Determination of energy requirements; Measurement of energy;
Conversion of energy. Economy of energy usage.

AGE 808: Advanced Agric. Machinery and Equipment Design - 3 units
Mechanical and experimental analysis of selected mechanisms used in agricultural machine, Advanced Kinematics and dynamics of motion in three dimensions. Vibration theory with application to vibration absorption and isolation, critical analysis of force and stress on components of agricultural machines, Mechanics and design of traction and transport devices
Hydraulic controls. Design of post-harvesting systems.

AGE 812: Tractor Design - 3 units
Theory and application of hydraulic and power transmission systems used in tractors. Laboratory practical to related to the functional requirements of tractors. Pneumatics and its application to Agric. Engineering systems; Applied thermodynamics, design of internal combustion engine for tractive power, lubrication system, design of control system. Tractor test and performance.

AGE 899: Research Projects - 6 units per semester
Independent research on a selected topic or project investigation, chosen in consultation with the student's supervisor. It is intended to develop the student's supervisor. It is intended to develop the student's investigative and creative abilities, and solve problems of interest and benefit to the society and enhance

technological development. A thesis will be submitted on completion.

AGE 831 Principle and Theory of Grain Drying - 3 units
Nature of water in Agricultural Material. Moisture migration in Agricultural Material. Drying, dehydration and irradiation. Drying rate and drying constant. Psychometric properties of air. Air movement in grain. Dryer types and classification. Cross flow, concurrent flow and counter flow dryers, Continuous flow and batch flow dryer. Energy sources for drying. Dryer Design. Simulation of drying process.

AGE 832 Heat and Mass Transfer - 3 units
Laws of conduction, convection and radiation. Steady state conduction through solids, and from fluid to fluid. Thermal conductivity, diffusivity and differential. Lagging and insulation. Estimation of heat gains and losses through solids and fluid lagging and insulation. Heat transfer through single layer slab, single layer cylinder wall, multiple layer composite cylindrical wall. Transient conduction. Refrigeration and heat exchanger. Movement of moist air and heat in thin and dense grain layer. Theory of mass transfer.

AGE 833 Advanced Thermodynamics - 3 units
Review of system, state, properties and processes. Energy conservation and its thermodynamic applications. Flow and non-flow processes. Laws of thermodynamics. Steady flow energy equation. Psychometric and thermodynamic properties of drying air. Refrigeration system and heat pumps.

AGE 834 Advanced Food Engineering - 3 units
Food classifications. Particle size distribution and analysis. Mode of heat transfer. Heat exchangers. Fruit and vegetable processing. Pre cooling, soaking, washing, sorting, grading, peeling, cooling, cutting, blanching, etc. Tuber crop processing. Cereal and grain processing. Meat, fish and dairy processing. Juice and marmalade production. Food packaging, food preservation techniques. Plant design. Machinery for food processing. Food analysis and quality control.

AGE 835 Engineering Properties of Agricultural Material - 3 units
Nature and behaviour of Agricultural Material. Newtonian and Non-Newtonian fluid. Physical properties. Mechanical properties. Aerodynamic properties, Rheological properties. Rheological models. Aerodynamic models and theories. Hydrodynamic properties. Chemical and biological properties., Thermal properties. Electrical and Electronics properties. Optical properties.

AGE 836 Alternative energy and solar applications in storage, drying and processing - 3 units
Conventional energy sources. Alternative energy sources. Thermal energy. Mechanical energy. Chemical energy. Wind energy. Geothermal energy. Hydrothermal energy. Electrical energy. Solar energy. Law of conservation of energy. Energy conversion Harvesting and utilization of solar energy. Solar collectors, dryers, incubators, water heater, cooker etc. Design of solar system. Nuclea and fossil energy.

AGE 837 Advanced Storage Technology - 3 units
Review of storage systems. Moisture isotherm factors affecting grain storage systems: structural, biological, physical, chemical, climatic technical thermodynamic, insects' pests and rodents. Classification of storage system small/medium scale storage system: Evaporative cooling system (ECS), crib, traditional storage, pit, barn, etc. Short- and long-term storage. Large scale storage systems with emphasis on silo and warehouse. Controlled atmosphere (CA) storage systems: Cold and hermetic storage. Storage system accessories. Design of storage structures with emphasis on silo and cold storage systems.

AGE 838 Material Handling Technology - 3 units
Classifications of material handling equipment theory of agricultural material transport. Belt conveyor, bucket elevator, screw conveyor, chain conveyor and pneumatic conveyor. Specifications and standards for material handling equipment. Material handling and temporary storage. Design of material handling equipment. Packaging system. Characteristics of packaging materials and types of packaging systems.

AGE 839 Fish, Meat and Dairy Storage, and Processing - 3 units
Fish and seafood classification. Fish processing, Meat processing (beef, pork and poultry. Tendering and curing of meat and fish products. Preservation methods such as smoking, freezing, canning, irradiation, drying, refrigeration, etc. Controlled atmosphere storage for meat, fish and dairy products. Abattoir management. Dairy products - Filter milk, iced cream, cheese, butter, cultured milk, etc condensation, dehydration, classification, homogenisation, pasteurisation and sterilization. Oil extraction from fish and animal products. Design of machines for processing fish, meat and dairy products. Management of waste generated from fish, meat and dairy processing selected, a pass in the oral

examinations and a successful completion of the research project.

AGE 821: Bioclimatology – 3 units
Radiation - radiation laws, radiation in natural environments and in plant communities. Radiant energy balance plant-water relations soil-plant-atmosphere continuum. Energy balance and evaporation; Temperature, Wind. Drought and drought tolerance. Photosynthesis and respiration.

AGE 823: Irrigation and Irrigation System - 3 units
Irrigation methods: Surface, sprinkler, trickle and sub irrigation. Criteria for method of selection. Estimation of irrigation water requirements. Water conveyance distribution systems. Irrigation system layout. Irrigation scheduling. Design discharge in irrigation net works for water delivery. Irrigation canal alignment and design, canal lining. Fundamentals of irrigation structures design. Design criteria and procedures for regulating structures, conveyance structures, protective structures and energy dissipators. River diversion weirs and canal intakes Layout of surface irrigation land levelling.

AGE 824: River and Canal Hydraulics - 3 units
Basic hydraulic concepts; Pipe flow and pipeline systems; Open channel flow; Pumps and turbines; Design applications for pipelines, channels and pumps. Properties of sediment transport theories and applications in design. Head-works, sediment excluders, solid weir crests, energy dissipators, siphons.

AGE 826 Water Resources Engineering
Ecological cycles. Surface water hydrology and hydrometry; Data collection, data management and analysis; Resources assessments, catchments and reservoir yield. Flood flow analysis; Properties of aquifers and yield assessment.

AGE 825: Advanced Soils Conservation Techniques - 3 units
Soil Science - Management of soil resources.
Pedology, soil chemistry and the properties of soil water; Practical techniques for evaluating the important of soil water characteristics, including infiltration, seepage and drainage. classification of soils. Soil erosion and degradation. Soil conservation.

AGE 827: Advanced Drainage Systems - 3 units
Design of land drainage systems for sustainable agriculture surface, shallow and ground water drainage systems. Design criteria for sub-surface drainage systems in humid and arid areas. The reclamation and control of salinity in salt affected land.

AGE 828: groundwater Development - 3 units
Well and well field design, test\ng, construction, operation and maintenance. Infiltration galleries and sand storage dams. Pump selection and design.

AGE 830: Dams - 3 units
Introduction to embankment dam design including principal section decants, seepage and its control and instrumentation. Construction and maintenance requirements. Principles of slope stability analysis. Classifications of instabilities.

AGE 832: Management, Operation and Maintenance - 3 units
Definition: Operations, Maintenance, rehabilitation, reliability; Organisation and staffing ; Main system and on-farm water management; Data collection, processing and analysis; Monitoring and Evaluation. Renovate, modernize, rehabilitate.

AGE 841: Elements of Structural Analysis I - 3 units
Direct and shear stresses and strains, compound stress and strain. Shear and bending moment, stresses in beams. Trusses and plane frameworks, graphic statics, deflections of trusses. Deflection of beams, Cylinders and spheres, Circular plates. Thin walled sections

AGE 843: **Engineering Properties of Materials of Construction - 3 units**
Types of materials, steels, wood, concrete, rubber, plastics etc. used in construction. Materials will be treated in terms of manufacture or production, application, preservation and storage. Stress, strain and allowable stresses in various materials, material selection, concrete properties and mix-design.

AGE845: **Farmstead Planning and Building Environment - 3 units**
Concept of a modern farm set-up. The village environment and social arrangements. Types of structures needed in an efficient farm stead. The family house its layout and design. Structures for machinery storage and maintenance. The farm office and its functions. Thermodynamics of building-heat flow characteristics in buildings, heat exchange, ventilation, solar heat and control. Mechanical ventilation. Environmental parameters and their measurements.

AGE840: Buildings and Environments for Animal Production - 3 units
Environmental requirements for animals: heat exchange characteristics between animals and their surroundings, environmental factors and effects on reproduction and growth. Heat stress on animals in a tropical environment. Differential animal physical requirements and buildings to house them. Waste collection as part of housing design. Automatic feeding systems. Other specialized facilities.

AGE842: **Elements of Structural Analysis II - 3 units**
Long span structures, Statically indeterminate structures. Approximate analysis and stress analysis of statically indeterminate structures. Influence lines, plastic behavior of structures, deflections, Matrix and computer methods of structural analysis. Introduction to advanced structural mechanics.

AGE844: **Building Construction and Surveying - 3 units**
Survey instruments, horizontal distances measurements, leveling, measurements of horizontal and vertical angles field survey, setting batter boards, soil investigation, design of simple foundation and footings walls, roofs, structural design and simple frame work, selection of building materials, calculation of quantities, introduction to cmp. Design of storage buildings, storage inspection methods and quality control and losses. Packaging, etc.

AGE846: **Buildings and Environments for Crop Production - 3 units**
Green houses, glass houses and related structures-Construction, layout and needed controls. Plant growth characteristics and relation to the environment

AGE848: **Public Health Engineering - 3 units**
The role of the engineer in the control of the environment; considerations of the total environment (the Eco-system). Communicable and non-communicable diseases, epidemiology and vital statistics. Role and control of insects and rodents in disease transmission. Water supply and waste water problems; fundamentals of design of water and wastewater treatment facilities. Solid waste (refuse) handling and disposal. Air pollution and control.

AGE 851 Renewable Energy Technologies I
Solar Thermal and Electricity System, Concentrating Solar Power, Solar drying fundamentals, Applications and Innovations, Solar space heating and cooling, Solar desalination, Photovoltaic Systems, Modeling of Solar Thermal Power Systems.

AGE 852 Advanced Heat and Mass Transfer
Laws of conduction, convection and radiation. Steady state conduction through solids, and from fluid to fluid. Thermal conductivity, diffusivity and differential. Lagging and insulation. Estimation of heat gains and losses through solids and fluid lagging and insulation. Heat transfer through single layer slab, single layer cylinder wall, multiple layer composite cylindrical wall. Transient conduction. Refrigeration and heat exchanger. Movement of moist air and heat in thin and dense grain layer. Theory of mass transfer.

AGE 853 Renewable Energy Technologies II – Solar and Wind
Solar energy fundamentals of solar radiation: solar spectrum, intensity, and irradiance, solar photovoltaic (PV) systems: Design, installation, and operation, concentrated solar power (CSP) systems: technologies and applications, solar thermal energy: heating and cooling applications, wind energy basics: wind patterns, wind resources, and wind speed, wind turbines: types, components, and operation, wind farm design and development: site selection, grid connection, and optimization, socio-economics and environmental benefits of renewable energy, emerging trends in renewable energy sources, technologies for the selection, design and operation of renewable energy systems.

AGE 854 Renewable Energy Technologies III – Geothermal and Hydro
Geothermal energy resources: types, location, and characteristics, geothermal power plants: technologies and applications, direct use of geothermal energy: heating, cooling, and other applications, biomass sources: agricultural waste, forestry residues, and dedicated energy crops, biomass conversion technologies: combustion, gasification, and fermentation, biogas production and utilization: anaerobic digestion, biogas purification, and power generation, types of hydropower plants: run-of-river, storage, and pumped storage, hydropower system components: dams, turbines, generators, and powerhouses, environmental and social impacts of hydropower: water management, habitat, and community effects, hydrogen: type of clean hydrogen, carbon capture and utilization technologies, hydrogen uses in renewable energies technology.

AGE 855 Renewable Energy Equipment Design and Grid Integration
Design of solar material Technology (PVC), design of hydropower system (turbines), design of tidal wave and wind equipment, design of biogas, biofuel, and fuel cell

system, challenges of integrating renewable energy into the grid: intermittency, voltage fluctuations, and harmonics, grid integration technologies: power electronics, smart grids, and distributed generation.

AGE 856 Energy Storage Technology and Emerging Technologies

Types of energy storage technologies: fuel cells, inverters, batteries, pumped hydro, and compressed air, energy storage applications: grid stabilization, renewable energy integration, and backup power, problems and challenges of energy storage, artificial intelligence (AI) and renewable energy: optimization, forecasting, and control, internet of things (IoT) and smart grids: data collection, monitoring, and control, advanced energy storage technologies: solid-state batteries, ultracapacitors, and electrochemical energy storage

AGE 858 Renewable Energies Policy and Economics

Role of government, policy and regulatory framework related to renewable energy development in Nigeria and internationally, law and national legal structures, renewable energy economics, incentives, market mechanisms, insurance and financing models, renewable energy tax credits, carbon offsets and credits environmental regulations, environmental management systems, environmental impact assessment for renewable energies projects

AGE 860 Renewable Energies Projects

Project planning and development: feasibility studies, design, and engineering, project financing and implementation: funding sources, construction, and commissioning, project monitoring and maintenance: performance tracking, maintenance, and optimization

10. ACADEMIC STAFF

S/N	NAME	RANK	QUALIFICATION/SPECIALIZATION
1	Prof. A. E. Ajayi	Professor	B.Eng. (Akure), M.Eng., Ph.D. (Germany), MNSE, COREN (Regd) Soil, Water Resource and Renewable Resource Engineering
2	Prof. O. C. Ademosun	Emeritus Professor	B.Sc. (Ife), M.Sc., Ph.D. (Cranfield). Farm Power and Machinery
3	Prof. L. A. S. Agbetoye	Professor	B.Tech; M.Eng. (Akure): Ph.D. (Cranfield): MNSE, COREN (Regd) Farm Power & Machinery.
4	Prof. O. J. Olukunle	Professor	B.Tech. (Akure), M.Tech. (Akure), Ph.D. MNSE (Akure), COREN (Regd). Farm Power and Machinery.
5.	Prof. P. G. Oguntunde	Professor	B.Eng. (Akure), M.Eng., Ph.D. (Germany), MNSE, COREN (Regd) MNSE Soil, Water Resource and Renewable Resource Engineering
6	Prof. J. T. Fasinmirin	Professor	B.Eng.; MEng. PhD. (Akure). MNSE COREN (Regd.) Soil, Water Resource and Renewable Resource Engineering
7.	Prof C. O. Akinbile	Professor	B.Eng. (Akure), M.Eng.(Ibadan) PhD (Akure). MNSE, COREN (Regd) Soil, Water Resource and Renewable Resource Engineering
8	Prof F. R. Falayi	Professor	B.Eng. (Akure), M.Eng.(Ibadan) PhD (Akure). MNSE, COREN (Regd) Farm Structures and Renewable Energy
9	Prof. A. P. Olalusi	Professor	B.Eng.; M.Eng. PhD (Akure). MNSE Processing & Storage and Renewable Energy
10	Prof. K. F. Jaiyeoba	Professor	B.Eng (Akure.; M.Eng. PhD (Ibadan). MNSE Processing & Storage
11	Prof. O. O. Olubanjo	Professor	B.Eng.; M.Sc. PhD (Akure). MNSE; COREN (Regd) Soil & Water Engineering
12	Prof. A. S. Oyerinde	Professor	B.Eng.; M.Eng. PhD (Akure). MNSE; COREN (Regd) Processing & Storage
13	Prof. O. O. Olanrewaju	Professor	B.Eng.; M.Eng. PhD (Witwatersrand); COREN (Regd) Soil, Water Resource and Renewable Resource Engineering
14	Dr. John Isa	Reader	B.Eng.; M.Eng. PhD (Akure)MNSE; COREN (Regd) Processing & Storage and Renewable Energy
15	Dr. B. O. Soyoye	Reader	B. Eng.; M.Eng. PhD (Akure)MNSE; COREN (Regd) Farm Power & Machinery
16	Dr. (Mrs) O. O. Olabinjo	Senior Lecturer	B. Eng.; M. Eng., PhD (Akure) COREN (Regd) Processing& Storage
17	Dr. O. A. Adetola	Senior Lecturer	B. Eng.; M. Eng. PhD (Akure)MNSE; COREN (Regd) Farm Power & Machinery
18	Dr. S. O. Oladele	Senior Lecturer	B. Eng.; M. Eng., PhD, MNSE; COREN (Regd) Processing& Storage
19	Dr. A. O. Jongbo	Senior Lecturer	B.Eng.; M. Eng. PhD (UK)MNSE; COREN (Regd) Farm Structure
20	*Engr. H. A. Yusuf	Lecturer II	B. Eng.; M. Eng. MNSE; COREN (Regd) Soil & Water Engineering
21	* Engr. Mrs. I. F. Omotade	Lecturer II	B. Eng, M. Eng. MNSE; Soil & Water Engineering
22	* Engr. P. A. Adeduntan	Assistant Lecturer	B. Eng., M. Eng.
23	* Engr. E. A. Olukunle.	Assistant Lecturer	B. Eng., M. Eng.

* on PhD

9.7.2 DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING (CVE)

1. PROGRAMMES OFFERED

(a) PGD, Civil and Environmental Engineering
(b) Master of Engineering (M ENG), Civil and Environmental Engineering
(c) Doctor of Philosophy (Ph.D), Civil and Environmental Engineering

2. AVAILABLE OPTIONS/SPECIALIZATIONS

a) PGD, General Civil and Environmental Engineering

b) Master of Engineering (M. Eng.) in
i) Structural Engineering
ii) Transportation Engineering
iii) Water Resources and Environmental Engineering
iv) Geotechnical Engineering
v) Construction Engineering

c) **Doctor of Philosophy (Ph.D)** in
i) Structural Engineering
ii) Transportation Engineering
iii) Water Resources and Environmental Engineering
iv) Geotechnical Engineering
v) Construction Engineering

3. PHILOSOPHY AND OBJECTIVES

(a) PGD, Civil and Environmental Engineering**:**

To provide an opportunity for advanced professional education and training in Civil and Environmental Engineering for:

(i) Those who wish to upgrade their technical knowledge in the profession without necessarily seeking advanced research – oriented degree,

(ii) Those who wish to make up for the deficiencies in their academic background to satisfy the requirement for the practice of engineering, and

(iii) Those who wish to bridge their academic career from the practical oriented higher national diploma course to the more theoretical, research-based studies in the university, and subsequently pursue higher degree course.

The programme is designed in such a way that those who successfully complete it can easily pass their Examinations for professional registration in Nigeria. Those who complete the course with a minimum of 3.0 grade point average and requisite qualifications as stipulated by senate can also proceed to higher degrees.

(b) Master of Engineering (M Eng) and Doctor of Philosophy (PhD)

Civil and Environmental Engineering deals with the planning, design, analysis, construction, operation and maintenance of the physical systems that form multi-purpose, environmental, transportation, and hydraulic installation, as well as structures such as buildings, bridges, etc. It involves urban planning, management of water and air resources, control of water, air pollution and solid wastes, soil investigation and analysis, and the engineering aspect of environmental health. The field is so wide that the work of civil and environmental engineers touches practically every aspect of human living. There is therefore the need to continue to train, in the several specialties of the profession, those graduates who have the motivation and ability to undertake programmes of advanced courses and research.

The programme is designed with the following objectives;

(i) To provide the student an opportunity to develop his/her special area of interest in realization of the full extent of his/her capabilities

(ii) To enable the student learn the fundamental concepts of their special field of Civil and Environmental engineering that will enable him/her to achieve high degree of professional competence.

(iii) To teach advanced courses with emphasis on the treatment of practical engineering problems, and problem solving techniques.

(iv) To develop and apply the student's intellectual qualities, technical ability and critical judgment expected in the engineering profession.

(v) To attract practicing engineers who wish to update themselves on the latest developments in their fields of specialization,

(vi) To conduct research relevant to the technological development of the country and contribute to technical knowledge

4. ADMISSION REQUIREMENTS

(a) PGD

Candidates seeking admission to the programme must have a credit pass each in English, Physics, Mathematics, Chemistry and one other relevant subject plus any of the following:

(i) B.Sc., B.Eng, or B.Tech. degree in Civil Engineering with third class.

(ii) B.Sc. degree in Building with a minimum of second class (lower)

(iii) B.Sc. or B. Eng. degree in Water Resources Engineering with at least a third class.

(iv) HND in Civil Engineering with at least lower credit

(v) HND in Water Resources Engineering with at least lower credit

(b) M. Eng.

In addition to satisfying the general University regulations for admission, candidates eligible for admission shall normally:

Hold Bachelors of Engineering (B. Eng.) degree with at least Second Class Honours (lower division) in Civil and Environmental Engineering of the Federal University of Technology, Akure or any other recognized universities that run NUC and COREN-Accredited Civil Engineering programmes,

Candidates with PGD in Civil Engineering with minimum CGPA of 3.0/5.0.

i. Other qualification in closely related disciplines such as Water Resources Engineering with a good technical underpinning, which can be considered equivalent to the above, may be accepted for admission.
NB: Candidates with BSc, B.Eng in Agricultural Engineering can apply but can only run the programme in Water Resources and Environmental Engineering.

(c) Ph. D

Candidate for the Ph. D programme should normally have obtained

(i) M. Eng. Degree (Civil and Environmental Engineering) of the Federal University of Technology, Akure or from any other recognized universities that run NUC and COREN-Accredited Civil Engineering programmes, with an overall CGPA of 3.5/5.0 or 70% equivalent.

ii) Master's degree in a close related discipline may also be considered with the provision of additional course work in meeting the student's approved research objectives in his area of specialization

5. DURATION OF PROGRAMME

(a) PGD, Civil and Environmental Engineering:

The programme is for a minimum of four (4) semesters and a maximum of six (6) semesters of course work and project

(b) M. Eng.

The M. Eng programme consisting of course work and research will normally last for a period of 18-24 months on a full-time basis.

(c) Ph.D:
The Ph.D programme is a research study lasting for a period of 36 – 48 months full-time or 48 – 72 months part-time.

6. REQUIREMENTS FOR GRADUATION

(a) PGD, Civil and Environmental Engineering:

Candidate must complete a minimum of 67 units comprising 61 units of course work and 6 units of independent project. The project will be conducted under the supervision of a senior academic staff, and culminate in a report that will be examined and approved by a panel of examiners.

(b) M. Eng.

For the Master's degree, students must complete successfully a minimum of 36 units of course work including at least 12 units of research project. A student must demonstrate, in the research project, familiarity with the tools of research and scholarship in his selected area of specialization in Civil and Environmental Engineering, ability to work independently as a research scholar and present effectively the results of his investigation.

(c) Ph.D:

The PhD degree is awarded majorly on the recognition of the candidate's high attainments and scholastic ability in his specialization. This is demonstrated by a continuous independent research work successfully completed under the general supervision of selected senior academic staff. The Ph.D thesis emanating from the research project is expected to demonstrate originality and power of independent investigation, creativity, thought and work. The results of the research must form a contribution to knowledge and be disseminated in reputable journals.

7. COURSE OUTLINE

(a) PGD:

1ST YEAR

1ST SEMESTER

Course Code	Course Title	L	T	P	Units
CVE 709	E Engineering Mathematics	2	1	0	3
CVE 711	Engineer-in-Society	1	1	0	2
CVE 713	Structural Analysis I	2	1	0	3
CVE 715	Soil Mechanics	2	0	3	3
CVE 717	Fluid Mechanics	1	1	3	3
CVE 719	Civil Engineering Materials	1	0	3	2
	TOTAL				**16**

2ND SEMESTER

Course Code	Course Title	L	T	P	Units
CVE 706	Engineering Mathematics II	1	1	0	2
CVE 708	Research methodology in Engineering and Technical Report Writing	1	1	0	2
CVE 710	Structural Analysis II	2	1	0	3
CVE 712	Geotechnical Engineering I	2	0	3	3
CVE 714	Hydrology	1	1	0	2
CVE 716	Civil Engineering Practice	2	1	0	3
CVE 718	Transportation Engineering I	1	1	3	3
	TOTAL				**18**

2ND YEAR

1ST SEMESTER

Course Code	Course Title	L	T	P	Units
CVE 721	Statistical Methods	1	1	0	2
CVE 723	Numerical Method & Computer Prog.	1	1	3	3
CVE 725	Design of Reinforced Concrete Structures	2	0	3	3
CVE 727	Hydraulic Engineering	2	1	0	3
CVE 729	Transportation Engineering II	2	1	0	3
CVE 731	Environmental Engineering	1	1	3	3
CVE 799	PGD Research Project	0	0	3	3
	TOTAL				**20**

2ND SEMESTER.

Course Code	Course Title	L	T	P	Units
CVE 720	Construction Management	2	0	0	2
CVE 722	Law, Management & Entrepreneurship	1	1	0	2
CVE 724	Geotechnical Engineering II	2	0	3	3
CVE 726	Design of Structures in Steel and Timber	1	1	3	3
CVE 728	Water Resources Engineering	1	1	0	2
CVE 799	PGD Research Project	0	0	3	3
	TOTAL				15

(b) M. Eng.

1ST SEMESTER

Course Code	Course Title	L	T	P	Units
CVE 801	Analytical Method in Engineering	3	0	0	3
CVE 803	Engineering Project Planning and Management	3	0	0	3
CVE 821	Advanced Soil Mechanics	3	0	0	3
	Specialty Course– 3 Nos	0	0	0	9
	TOTAL				**18**

2ND SEMESTER

Course Code	Course Title	L	T	P	Units
CVE 802	Applied Statistics for Engineers	3	0	0	3
CVE 804	Research and Technical Report writing	3	0	0	3
CVE 806	Civil Engineering Systems and Project Management	3	0	0	3
	Specialty Course – 3 Nos	0	0	0	9
	TOTAL				**18**

List of Courses for M.Eng programme

I Common Courses

Course Code	Course Title	L	T	P	Units
CVE 801	Analytical Method in Engineering	3	0	0	3
CVE 802	Applied Statistics for Engineers	3	0	0	3
CVE 803	Engineering Project Planning and Management .	3	0	0	3
CVE 804	Research Methodology and Technical Report writing	2	0	0	2
CVE 806	Civil Engineering System and Project Management	3	0	0	3
CVE 821	Advanced Soil Mechanics	3	0	0	3
	TOTAL				**17**

II Specialty Courses:

A. Structural Engineering Courses

Course Code	Course Title	L	T	P	Units
CVE811	Advanced Structural Analysis	3	0	0	3
CVE812	Structural Dynamics	3	0	0	3
CVE813	Advanced Design of Steel and Timber Structures	2	3	0	3
CVE814	Theory of Plates and Shells	3	0	0	3
CVE815	Advanced Design of Reinforced and Prestressed Concrete	2	3	0	3
CVE816	Theory of Elasticity	3	0	0	3
	TOTAL				**18**

B. Geotechnical Engineering Courses

Course Code	Course Title	L	T	P	Units
CVE821	Advanced Soil Mechanics	3	0	0	3
CVE822	Advanced Foundation Engineering	3	0	0	3
CVE825	Dams and Water Retaining Structures	2	0	3	3
CVE826	Design of Earth and Rock Dams	2	0	3	3
CVE828	Soils Dynamics	3	0	0	3
CVE866	Tropical Soils of Nigeria in Engg Practice	3	0	0	3
	TOTAL				**18**

C. Transportation Engineering Courses

Course Code	Course Title	L	T	P	Units
CVE831	Pavement Design and Soil Stabilization	3	0	0	3
CVE832	Transportation Planning	3	0	0	3
CVE833	Advanced Highway Engineering	2	0	3	3
CVE834	Transportation Engineering	3	0	0	3
CVE835	Traffic Analysis and Design	2	0	3	3
CVE836	Highway Materials and Construction	2	0	3	3
	TOTAL				**18**

D. Water Resources and Environmental Engineering Courses

Course Code	Course Title	L	T	P	Units
CVE841	Advanced Hydrology	2	0	3	3
CVE842	Water Resources Engineering, Systems and Management	3	0	-	3
CVE843	Advanced Hydraulic	3	0	-	3
CVE844	Groundwater Engineering	3	0	-	3
CVE845	Environmental and Public Health Engineering	2	0	3	3
CVE846	Statistical Hydrology and Watershed Modelling	2	0	3	3
CVE848	Water Supply and Sewage	2	0	3	3
	TOTAL				**21**

E. Construction Engineering courses

Course Code	Course Title	L	T	P	Units
CVE861	Construction Materials and Method	3	0	0	3
CVE863	Feasibility Studies, Design and Optimization Of Construction Method	3	0	0	3
CVE864	Construction Engineering	3	0	0	3
CVE865	Construction Management	3	0	0	3
CVE867	Civil Design and Architecture	3	0	0	3
CVE868	Computer Techniques to Civil Engineering Problem	3	0	0	3
CVE876	Urban Development and Public Works Eng.	2	0	3	3
	TOTAL				**21**

Note: Specialty courses will be selected on the basis of availability of lecturers, but with full consideration of the research interests of the students.

RESEARCH

3rd semester (1st Semester of 2nd Session)

Course Code	Course Title	L	T	P	Units
CVE899	Master's Thesis Project	0	0	0	12

Ph.D programme

Course Code	Course Title	L	T	P	Units
CVE999	Doctoral Research Project	0	0	0	24

1. COURSE SYNOPSES

A. PGD

CVE 709: Engineering Mathematics I (2, 1, -) 3 Units
Review of matrix operation including inversion, Eugen values, Eigen vector and Canonical transformations and application. Three dimensional vector representation, vector calculus, gradient, divergence and curl line, surface and volume integral, Laplacian operation. Green's, Strokes and Divergence theorems and applications. Ordinary and partial differential equation, special functions and integral, problem formulation, simple method of solution.

CVE 711: Engineer-in-Society (1, 1, -) 2 Units
Philosophy of science, History of engineering and technology. Safety in engineering and introduction to risk analysis. The role of engineers in nation building. Invited Lecturer from Professionals. Technology in society-growth and effect. The role and responsibilities of the engineer in society – education and engineers. Professional bodies and engineering societies – aims and objectives, structure and functions.

CVE 713: Structural Analysis (2, 1, -) 3 Units
Review of statical/kinematic indeterminacy. Displacement in structure: Virtual work method, Double integration, Macaulay's singularity function, Conjugate beam method, Moment- Area method. Influence lines for determinate and redundant structures. Analysis of structure: Method of Consistent deformations, Least work, Slope-deflection, and Moment distribution.

CVE 715: Soil Mechanics (2, -, 3) 3 Units
Mineralogy of soils, soil structure, origin of soils – rocks and mineral. Formation of soils, and soil deposits, soil

properties. Soil and water relationship- void ratio, porosity, specific gravity and other factors. Soil Classification; Atterberg limits, particle size distribution. Flow of water in soils; seepage (permeability, flow net), permeability, and ground water flow. Compaction and soil stabilization. Site investigation, and methods of subsurface exploration: boring and sampling tools/equipment, disturbed/undisturbed sampling, SPT, Dutch cone, vane and plate load tests, report writing, Laboratory tests, Soil survey and soil map study.

CVE 717: Fluid Mechanics (1, 1, 3) 3 Units
Fluid properties, static and buoyancy and stability of floating and submerged bodies. Fluid flow concepts and basic equation. Dimensional analysis, dynamic similitude. Flow of real fluids: viscous effects, resistance, compressible flows, velocity potential, Bernoulli equation; streamlines and flow nets. Application of fluid mechanics; fluid measurement; turbo machinery, steel closed – conduct flows, steady flow in open channels. Unsteady flows.

CVE 719: Civil Engineering Materials (1, -, 3) 3 Units
Description of the various materials used in Civil Engineering construction and determination of their properties. Concrete technology – types of cement, sand, aggregate and concrete mix design. Steel technology-production and fabrication, steel properties, corrosion and its prevention. Timber technology – type of wood properties and defects, wood preservation and fire protection. Other major materials such as asphalt, tar and rubber plastics, glass, lime and soils, Structure of the construction industry, construction, planning, administration, earthworks and earth moving construction equipment. Total quality management in construction. Application of operation research techniques in construction work.

CVE 706: Engineering Mathematics II (1, 1, -) 2 Units:
Complex Variable Function, deviation, language series, Taylor series, Cauchy theorem, Cauchy formula, Cauchy integrals. Analytic functions, singular points, Residual problems, Conformal problems and mapping. Special functions: Gamma, Delta, Beta and error functions. Fourier integral, Fourier transform for solving partial differential equations.

CVE 708: Research Methodology in Engineering and Technical Report Writing (1, 1, -) 2 Units
Development of skills to undertake a comprehensive literature review and research project plans. Introduction to the general principles, methodologies and practices of data collection (both qualitative and quantitative) and analysis in qualitative research, analytics, content analysis, design aspects and research ethics. Data analysis tools will be covered as well as understanding the validity and reliability of data. Communicating scientific findings including writing academic publications and presentations.
Principle of communication. Preparation and writing of technical reports. Oral presentation. Use of visual aids and other communication equipment in technical and research presentations.

CVE 710: Structural Analysis II (2, 1,-) 3 Units
Matrix method of structural analysis: Flexibility and stiffness methods. Plastic analysis of structures. Finite difference and finite element techniques. Analysis of plates and thin shells. Introduction to structural dynamics.

CVE 712: Geotechnical Engineering I (2, -, 3) 3 Units
Stresses in soils: Total and effective stress, pore pressure. Moduli of Elasticity, Poisson's ratio. Introduction to stress distribution in layered system from Boussinesq's theory, Westergaard theory. Earth retaining structure; Earth pressure (active, passive and at-rest pressure), earth pressure coefficients, Computation of earth pressure using the Rankie and the Columb wedge theories, and Culman's method. Earth pressure on retaining walls. Types and analysis of retaining walls. The use of bracings as lateral support in open cuts. Anchored bulkheads. Free earth support method of analysis. Bearing capacity: Ultimate, safe and allowed bearing capacities. Bearing capacity factor. Case of shallow and deep foundations. Factor of safety, shape effect, footing under eccentric and inclined loads. Foundation; Type and choice of foundation and piles. Use and general characteristics of piles, piles and sand piles in clay, negative skin friction. Bearing capacity of pile groups. Eccentric vertical loads dynamic pile driving formulas and efficiency of pile groups. Foundation subjected to dynamic forces.

CVE 714: Hydrology (1, 1, -) 2 Units
Hydrology cycle, History of hydrology, scope and application of hydrology, climatic measurement, precipitation and precipitation analysis, Analysis of hydrologic data including statistical inferences, infiltration, Evaporation and Evapotranspiration, Runoff and hydrograph analysis. Stream and reservoir routing, Ground water exploration and well hydraulics, sediment transport. Design criteria for water related projects.

CVE 716: Civil Engineering Practice: (2, 1, -) 3 Units
The engineering industry, management techniques, Project planning and implementation. Elements of

business and industrial law as they relate to civil engineering practice. Case studies. Civil Engineering as a profession; function, training and responsibilities. Requirement for registration with professional bodies, roles and responsibilities of parties in Civil Engineering projects. Stages of engineering projects execution including conception, feasibility studies, detailed design, preparation of Civil Engineering quantities, BEME, type of contract, preparation of contract of documents, tendering procedures, evaluation and award, Law of contracts, Arbitration Law.

CVE 718: Transportation Engineering I (1, 1, 3) 3 Units
Introduction to different modes of transportation: Highways, Railways, Air transport and Airports, Water transport, dock and harbours, pipelines, conveyor belts. Traffic flow theory (Flow, density and speed relationships), Time mean speed and Space mean speed Time-Space diagrams, Microscopic and macroscopic models, Traffic management and control: signages, traffic signals, traffic flow optimization, queue analysis, Road safety and accident analysis: causes of road accidents, Accident statistics, Investigation and rates, Accident reconstruction, Highway lighting: Design factors of highway lighting, Benefits of highway lighting.

CVE 721: Statistical Methods (1, 1, -) 2 Units
Descriptive Statistics: Central tendencies and dispersion. Elementary probability theory, conditional probability, Baye's theorem. Probability distributions and applications. Elementary theories of sampling and estimation. Tests of hypothesis and significance. Curve fitting, Linear and Multiple regression analysis; Linear correlation, analysis of variance, Time series analysis, Statistical quality control mean, standard deviation, range, number of defects etc., sampling techniques, average sampling number, stochastic processes.

CVE 723 Numerical Method and Computer Programming (1, 1, 3) 3 Units
Gaussian elimination, Gauss-Seidel methods and Newton-Raphson Heraton methods of solving linear equation. Forward and backward difference tables, central difference formula, Finite difference Solution to partial differential equations. Solutions of ordinary differential equation (1st and 2nd order) using Runge-Kutta method. Flow charting, Algorithms, inputs and output, Basin, Fortran and modern Languages. Computer software analysis, Highway/Transportation, geotechnical, Hydraulics/Hydrology problems and construction management. ICT.

CVE 725: Design of Reinforced Concrete Structures (2, -, 3) 3 Units
Process of structural design. The role of properties of engineering materials, especially steel and concrete, in structural design. Building regulation, standards and codes of practice. Elastic design, load factor, and the limit state design philosophy. Balanced design, over-reinforced and under-reinforced concrete elements to BS8110: slabs, beams, columns, foundation. Design of multi-storey buildings.

CVE 727: Hydraulic Engineering (2, 1, -) 3 Units
Types of flows in open channel and closed conduits, turbulent flows. Water waves and wave characteristics. Steady and unsteady, uniform and non-uniform flow in open channel, Natural streams back water curve. Hydraulic jumps and energy dissipation. Hydraulic similitude and application to hydraulic models. Water hammer, water turbines and centrifugal pumps.

CVE 729: Transportation Engineering II (2, 1, -) 3Units
Route location and design (reconnaissance survey, preliminary location survey, final location survey), Geometric design of highways: pavement carriageway, traffic separators or medians, camber, design speed, design capacity, vehicle characteristics, kerbs, stopping sight distance, passing sight distance, vertical and horizontal alignment, super-elevation, pavement design and construction (flexible and rigid pavements) using the Group index, California Bearing ratio and Hveem methods, Pavement condition assessment and rating systems, Economic analysis of highway construction projects (Life cycle cost analysis method and Benefit-cost ratio method), Highway materials, Drainages and earthworks.

CVE 731: Environmental Engineering (1, 1, 3) 3Units
Examination of Water and Wastewater. Collection, treatment, protection and distribution (including design of facilities) of water, municipal and industrial Wastewaters. Fundamental of solid Waste Management, Air Pollution Control, Stream Pollution.

CVE 720: Construction Management (2, -, -) 2 Units
Introduction to management and project management. Planning, design, development control and evaluation of civil engineering projects. Project budget, work plan, scheduling and tracking, contract system. Project organization, economic analysis, Cultural and human resources issues in project development. Personnel management, manpower planning and development, operation and maintenance of built project and construction phase of civil engineering projects. Total

quality management. Application of operation research techniques in construction work. Network analysis and chart labour laws, site safety, and law of Torts

CVE 722: Law, Management and Entrepreneurship (1, 1, -) 2 Units
Principle of Management, Industrial group and organizational behavior, Motivation, Industrial Law, legislation of wages, trademarks and patents, Laws of contract and sales of goods. Liability for industrial injuries, industrial relations, trade unions, employer associations, wages bargaining and the role of the state. Relevant topics on entrepreneurship designed by the National Universities commission for Nigerian Universities.

CVE 724: Geotechnical Engineering II (2, -, 3) 3 Units
Consolidation and settlement; One-dimensional consolidation. The oedometer test. Primary and secondary consolidation. Immediate and consolidation settlement. Analysis of total and time rate of settlement. Settlement of spread and pilled foundations. Shear strength of soils: General strength consideration. State of stress at a point and Mohr stress circle. Mohr Coulomb theory of failure. Shear Tests: Vane shear test, direct shear test, triaxial test. Shear strength of saturated clays, shear strength of compacted unsaturated clays, sensitivity of soil, residual strength parameter. Slope stability: Types and mechanics of slope failures. Theoretical and graphical solution of slope stability problems. Short term and long term slope stability problems. Unsupported vertical cuts. Effect of tension cracks on slope stability.

CVE 726: Design of structures in Steel and Timber (1, 1, 3) 3 Units
Review of design of steel members in tension compression and bending. Design of structural steel connection. Design of beams, compound beams, columns, compound columns, Industrial columns and columns foundations. Analysis of lattice order: Trusses, portal frames, General frames, masts, tower etc. Review of design of Timber members in tension, compression and bending. Design of Timber connection, beams, trusses, columns, towers masts etc. Types and properties of Timber species in Nigeria.

CVE 728: Water Resources Engineering (1, 1, -) 2 Units
Urban hydrology, Drainage and Land reclamation, Dam and reservoirs, spillways and stilling basins, Design of irrigation Canals, Hydropower, River Basin Planning, Water Supply Engineering.

CVE 799: PGD Research Project (3 Units per Semester) 6 Units
A guided/supervised individual investigation of a civil engineering problem in the student's chosen topic, under staff direction. A project report on the topic demonstrating creative engineering ability and utility, must be written and will be examined and approved by a panel of examiners.

B. M. ENG

CVE 801: Analytical Method in Engineering (3, -, -) 3 Units
Development of mathematical methods commonly found in the literature of applied physics and engineering with emphasis on techniques used in system engineering, Matrix analysis. Solution of ordinary and partial differential equation, and application, Laplace transform and its properties, Fourier series, Bassel functions, Harmonic analysis, Complex function and conformal mapping. Operational calculation, Numerical methods.

CVE 802: Applied Statistics for Engineer (3, -, -) 3 Units
Concept of randomness and probability. Frequency distributions, measures of central tendency and dispersion, measures of association, correlation and regression, expectation, derived distribution and sampling. Theories of estimation and significance testing. Regression analysis. Probability models for physical situations. Principles and practice of experimental design, Analysis of variance, factorial designs.

CVE 803: Engineering Project Planning and Management (3, -, -) 3 Units
Planning, control and evaluation of large scale projects. Scheduling, contract system technology, project productivity. Human factors, including technical, political, economic, social and environment factors. Simulation of the planning, design and construction processes. Network based systems for planning, time and cost of projects. Organization structures for communication and control. Economic of scale in building design and operations, Contract and documents.

CVE 804: Research and Technical Report Writing (3, -, -) 3 Units
Development of skills to undertake a comprehensive literature review and research project plans. Introduction to the general principles, methodologies and practices of data collection (both qualitative and quantitative) and analysis in qualitative research, analytics, content analysis, design aspects and research ethics. Data

analysis tools will be covered as well as understanding the validity and reliability of data. Communicating scientific findings including writing academic publications and presentations.

CVE 806: Civil Engineering System Analysis and Project Planning (3, -, -) 3 Units
Analysis of Civil Engineering projects from a system concept. Methodology of a comprehensive and integrated approach to solving complex problems. Study of various mathematical programming techniques for optimization and simulation and application to problems of transportation, structure, construction, water resources management, environmental system and urban development. Management concepts applied to civil engineering projects realization. Project organization and related technical, political, economic, social and environmental factors. Engineering economic analysis of projects.

CVE 811: Advanced Structural Analysis (3, -, -) 3 Units
Virtual work theorems for forces and displacements. Torsion and lateral buckling. Matrix methods of structural analysis. Flexibility method; Stiffness method; the direct stiffness method. Influence lines for redundant structures: Continuous beams, Trusses, Rigid frames, Arches, Analysis of beams-columns on elastic foundation. Building frames subjected to lateral forces. Analysis of continuous arch frames. Recent development in theory of structures. Application of structural analysis computer software packages.

CVE 812: Structural Dynamics (3, -, -) 3 Units
Analysis of system with one and several degrees of freedom. Problems involving non-linear force-displacement relation and damping. Determination of natural frequencies of structures. Vibration of flexural members. Numerical methods of analysis. Design application and computer solutions.

CVE 813: Advanced Design of Steel and Timber Structures (2, 1, -) 3 Units
Use of, and technical background to codes, standards and building regulations. Review of design of structural elements in steel, including steel girders. Design requirement for utility, and for multi- storey buildings. Design requirement for bridges, tanks, reservoirs, pressure vessels, and other heavy structures. Composite construction. Application of structural design computer software packages. Review of timber design and design process, design in the ultimate limit state and serviceability. Design of timber joints. Composite timber elements. Horizontal stabilization. Cross section subjected to shear and to combined stresses. Connections.

CVE 814: Theory of Plates and Shells (3, -, -) 3 Units
Methods of calculating stresses and deformation in plates and shells used under various conditions, membrane and flexural analysis of shells of revolution within the design of domes, container and pressure vessels. Stability analysis of shells structure. Influence of initial stresses and large deformations. Thermal effect in shell structures. Analysis of composite shell structures.

CVE 815: Advanced Design of Reinforced and Prestressed Concrete (2, 1, 0) 3 Units
Fundamental of reinforced concrete (RC) theory, design and analysis. Analysis and design of beams, slabs, and columns. Preliminary designs and the role of appropriate method. Shear distribution in multi-storey building frames subjected to lateral forces. Bond mechanics of reinforced concrete, the concrete model before and after cracking, the average shear stress-normal strain relation and crack angles, the complete soil-structure system of nonlinearity. Strengthening of RC members failing in shear and flexure. Application of structural design computer software packages. Principles of prestressed concrete, prestressing systems, end anchorage and loss of prestress. Analysis and design of sections for flexure, shear, bond, bearing and deflection. Continuous beams, slabs, tension and compression members. Circular prestressing, Current building codes, specifications and practices.

CVE 816: Theory of Elasticity (3, -, -) 3 Units
Notion of stress and strain. Basic equation of linear theory of elastic media. Stress functions and displacement potentials. Application to specific classes of problem, such as plane strain, contact stresses, exisymmetric problems. Stress concentration singular states of stress. Dislocation and residual stresses. Wave motion in elastic media.

CVE 821: Advanced Soils Mechanics (3, -, -) 3 Units
Summary of common clay minerals, clay mineralogy and clay water system, Rate of consolidation, Accelerating consolidation with sand drains and surcharge, Shear strength of saturated clays, Stress paths, Shear strength of compacted unsaturated clays, undrained vane shear test, Review of slope stability of non-circular slip surfaces, Foundation subjected to dynamic forces, maintenance; Avoiding faults and failures in construction materials and foundations, Presentation of term paper

on a given topic on soil mechanics and foundation engineering

CVE 822: Advanced Foundation Engineering (3, -, -) 3 Units
Foundation designs settlement calculations, consolidation. Slope stability. Foundation on elastic supports. Land drainage in relation to foundations. Settlement of foundation in cohesive and cohesionless soils. Pile foundations–rigid and flexible sheet pilling cofferdams, hydraulic structures.

CVE 825: Dams and Water Retaining Structures (2, -, 3) 3 Units
Selection of the type of dams, Design of earth dams, Design of rockfill dams, Design of concrete dams, Site visit to a dam site, Term paper and class seminar on dams.
Each student is expected to type and hand in one of the following and deliver it at a class seminar: Overtopped rockfill, cofferdams, cofferdam selection, Foundation grouting, Residual soils, Compressibility of rockfill, Shear strength of rockfill, Slurry trench and similar processes, Caissons, Planning and environmental studies, Hydrological studies of dam sites, Geomembranes, geotextiles, geogrids, specialty geosynthetic for erosion control of dams, Environmental impact assessment of dams.

CVE 826: Design of Earth and Rock Dams (2, -, 3) 3 Units
Design of earth dams, embankment and sheet pile structures. Engineering properties and behavior of rock masses; stability of rock masses. Methods of analysis and design of earth – retaining and water retaining structures. Seepages analysis, stability analysis. Foundation explorations. Influence of seepage on embankment stability. Construction control and field measurement of pore pressure and earth movements. Reservoir safety and long-term service performance of dams. Hydraulic design of spillways, reservoir and related structures. Project on real life dam designs are carried out by the students.

CVE 828: Soil Dynamics (3, -, -) 3 Units
Review of basic vibration theories as applied to soil machine. Elastic wave propagation in soils. Elements in seismic investigation. Dynamic densification of soil. Strength of soils under dynamic loading. Analysis of foundation in vibration. Blast loading on soils.

CVE 831: Pavement Design and Soil Stabilization (3, -, -) 3 Units
Highways and airfield soil classification and testing. Rigid and flexible pavement design, stresses and strains in flexible and rigid pavements. Properties of pavement components. Mechanism of soil stabilization, compaction, use of additive (aggregates, cement, asphalt, chemicals), special techniques. Principle and techniques of soil stabilization for use in foundation material in highways and air fields.

CVE 832: Transportation Planning (3, -, -) 3 Units
Regional and metropolitan transport studies. Current techniques of transportation planning including the development and use of mathematical models for trip generation, distribution and assignment. Application of multiple regression, linear programming recursive models and other techniques to land use and transportation planning. Transportation networks. Coordination of city planning and transportation engineering. Transportation administration and finance.

CVE 833: Advanced Highway Engineering (2, -, 3) 3 Units
Principle of highway design, subgrade soils, drainages, construction, and maintenance of pavement and road surfaces. Design of rigid and flexible pavements and culverts for highway and airports. Geometric highways designs – problems in highway, sheet and intersection capacity, location and design, rural and urban, at grade intersection design, grade separations and interchange design.

CVE 834: Transportation Engineering (3, -, -) 3 Units
In depth study of the functional and geometric design of highway and airports. Engineering principles of movement for all types of transportation. Technological characteristics of railways, highways, waterways, and pipelines. Engineering performance criteria. Operational control. Cost of service. Planning for transportation use. Economic analysis of alternate designs; system routs and component selection.

CVE835: Traffic Analysis and Design (2, -, 3) 3 Units
Scientific approach to the study of traffic phenomena with emphasis on applications. Deterministic and stochastic models of traffic flow; intersection control, computer stimulator of traffic problems. Causes and analysis of accident and congestion. Traffic surveys. Planning and design of physical facilities for controlling highway traffic. Parking studies, Techniques for improving traffic operations.

CVE 836: Highway Materials and Construction (2, -, 3) 3 Units
Soil in highways. Soil stabilization. Aggregates, Theoretical and practical design of concrete mixtures and use in highways and associated construction works. Bituminous materials and mixture sources, manufacture processing, types, constituents, development and laboratory tests and controls, chemical behavior, specification and uses in highway construction and maintenance. General highway materials. Construction of rigid and flexible pavements. Design, construction and maintenance of asphaltic concrete, Mix designs.

CVE 841: Advanced Hydrology (2, -, 3) 3 Units
Interrelationship of hydrologic cycle components – precipitation, interception, infiltration, evapotranspiration, groundwater flow and surface runoff. Analysis of precipitation and stream flow data. Hydrograph analysis and use. Flood studies. Runoff and basin response models. Hydraulic of groundwater and wells. Evapotranspiration and infiltration models. Use of hydrologic techniques in water resources studies, data collection and analysis. Design of hydrometric networks, engineering applications.

CVE 842: Water Resources Engineering, Systems and Management (3, -, -) 3 Units
Utilization of the principle of hydraulic, hydrology and environmental engineering in problems of erosion and flood control, power and irrigation navigations water supply, and water quality control. Economics and water laws in river basin planning. Water resources planning. Multipurpose projects. Design of selected hydraulic structures. Comprehensive planning of water resources. Use of advanced techniques for the design and analysis of complex, multipurpose water resources systems. Identification of the objectives of Design and translation of the objectives into design criteria. Evaluation of alternate designs and selection of the best design. Optimization and simulation techniques and their application to water resources systems. Modeling techniques. Analysis of multiple-purpose projects and comprehensive basin development. Principle of economic analysis of various types of water resources development.

CVE 843: Advanced Hydraulic (3, -, -) 3 Units
Application of the principle of fluid mechanism to practical problems of flows in closed conducts, open channels and hydraulic structures. Study of laminar flow, turbulent flow and diffusion in conduits and open channels. Uniform and non-uniform, steady and unsteady flow in open channels – velocity formulas and backwater curves. Flow through transitions, obstructions and bends. Analysis of energy losses in conduits, transitions and various types of hydraulic structures. Application of the energy and momentum principles in predicting the flow for various boundary configurations. Computational methods. Flood routing, waves and surges.

CVE 844: Groundwater Engineering (3, -, -) 3 Units
Study of groundwater as a source of municipal, industrial and agricultural water supplies. Location, occurrences and nature of groundwater flow. Analytical and numerical solution to flow equations. Well hydraulics. Groundwater modeling and management. Determination of aquifer and well characteristics. Well construction techniques. Well discharge and pumping tests analysis. Drainage problems. Artificial recharge. Salinity control. Conjunctive use. Optimal management of groundwater reservoir.

CVE 845: Environment and Public Health Engineering (2, -, 3) 3 Units
Fundamental of air quality and air pollution. Effect of pollutant on Environment. Methods of control of environmental hazards. Occupational and industrial hygiene. Impact of engineering projects on environmental quality. Engineering criteria for evaluating the adequacy of public health and environmental sanitation facilities. Introduction to the physical processes of mass transport in fluid due to diffusion, dispersion and convection. Mixing and dilution of pollutants discharge into natural water bodies. Mathematical modeling of water quality in stream and estuaries. Development of basic equation describing the distribution of conservatives and non- conservative contaminant in stream and estuarine water. BOD, COD, and DO, dynamics in stream and river parameter estimation. Salinity intrusion in coastal waters. Application of systems analysis to water quality management. Sources of infection, modes of transmission, diseases vectors, elementary epidemiology, rural sanitation, housing, food control, refuse disposal and control of insect vectors of diseases.

CVE 846: Statistical Hydrology and Watershed Modelling (2, -, 3) 3 Units Statistical method applied in hydrological data analysis. Theory and use of statistical distributions; log-normal, weibull and extreme value distribution. Time series analysis of hydrological data. Application of computer programmes and mathematical models to fits selected hydrological data. Introduction to GIS applications in water resources management, fundamentals of vector and raster data

types and GIS modeling in water resources management, development and editing TIN and DEM terrain, understanding basic hydrology functionality within ArcMap, terrain processing, watershed delineation and stream network analysis, hydrologic modeling using HEC-HMS and HEC-GeoHMS, hydrologic modeling using SWAT model, hydraulic Modeling and floodplain mapping using HEC-RAS and HEC-GeoRAS

CVE 848: Water Supply and Sewage (2, -, 3) 3 Units
Development of sources of water supply. Information analysis. Hydraulics of open channel and pipe flows. Water quality parameters and standard water quality criteria. Design of collection, transmission and distribution systems. Principle of water and wastewater treatment processes employed for domestic and industrial water supplies as well as for municipal and industrial wastes. Analysis and organization of various physical, chemical and biological processes involved in the treatment of waters and wastewater – aeration, coagulation, sedimentation, filtration and biological conversions. Functional study of plant loading in relation to degree of treatment desired; layout and hydraulic design of treatment process units. Mechanical and thermal energy requirement. Basis for design are presented, with methods for ultimate disposal, pollution control and reclamation.

CVE 861: Construction Materials and Method (3, -, -) 3 Units
Materials of construction – soils, cement, concrete, steel and other metals, timber, fibers and composites materials, bituminous materials. Static properties and use of material. Manufacture and performance characteristics and use of material. Method and equipment employed in processing the materials in high and heavy construction – Building, highways and their appearance

CVE 863: Feasibility Studies, Design and Optimization of Construction Methods (3, -, -) 3 Units
Study of the design process from the clients' requirement to the realization of the design on site including planning of design, creativity and innovation, the problem of analysis and evaluation of various optimization techniques. The application of computer to structural design and automatic detailing processes. The client, the consultant, evaluation of alternative lines of development, competitive cost estimate for design, construction and operation, translation of proposal into a detail brief, recommendation of types of contract after an investigation, supervision requirement during construction stage.

CVE 864: Construction Engineering (3, -, -) 3 Units
Quantitative and analytical techniques applied to construction processes. Operation research techniques and application to construction system optimization. Design studies. Planning reports, feasibility studies. Factors affecting the selection and purchase of construction equipment. Application of engineering fundamental to performance/output of construction equipment. Principle of cost estimation for the construction industry. Design of sewage collection works. Cost analysis of projects. Detailed engineering and management consideration related to the design, evaluation, and operation of solid waste storage, collection and disposal systems. Solid wastes survey. Incinerators evaluation and design. Composting, Salvage systems, Special wastes. New method of collection and disposal. Legal, political and administrative consideration. Cost analysis of solid waste management.

CVE 865: Construction Management (3, -, -) 3 Units
Management of design and construction in built environment. Management of resources of construction, financial, equipment, human resources from project conception to commission. Construction and industrial law- contract procedure and administration. Tendering procedure, contract document, insurance, Bonds, Safety and other acts relating to construction operations. Site and office management, organization and control methods, case studies and preparation and presentation of reports on construction operations, and problems in building and heavy construction in Nigeria.

CVE 866: Tropical Soils of Nigeria in Engineering Practice (3, -, -) 3 Units
Review of geology of Nigeria; Geotechnical properties and behaviour of Nigerian soils including lateritic soils, black cotton soils, deep organic clay stratum, soft clay shale, and compacted Fadama soils; Earthworks and foundation on recently deposited organic soils; Permeability of compacted soils; Groundwater and erosion including groundwater levels and ground movement, hydraulic of soil erosion; Engineering and geological applications including, availability of fine aggregate in river, soils for low cost housing, black cotton soils in road pavement design, construction and performance, and bitumen stabilized soils in road pavement construction; Flexible pavement design for tropical highways; Flexible pavement maintenance for tropical highways; Building material in hot and arid climate.

CVE 867: Civil Design and Architecture (3, -, -) 3 Units
Modern town planning and the historical tradition – objective in town planning (political, economic, sanitary) – Constraints in planning, (natural, technical, socio-economic etc.) – Concept in civil design, (shape, size, boundary, forces etc.) – The modern city prior to 1800 in the nineteenth century during the modern movement and the Garden city movement, urbanization, the model city: size, growth and change in the city as a whole, in its constituent parts.

CVE 868: Computer Techniques for Civil Engineering Problems (3, -, -) 3 Units
Revision of computer programming, Design methods. Computerized design systems. Computer graphics. Application to Civil Engineering problems. Examination of a selected series of engineering programs and programming systems.

CVE 876: Urban Development and Public Works Engineering (2, -, 3) 3 Units
Engineering in urban development; relation of transportation, sanitary works, drainage and other utilities to urban development. Surveying and mapping requirement. Housing Building codes. Public works engineering. The civil engineers' role in public works field; municipal engineering and public works responsibilities in planning, financing design, construction, operation and maintenance of public facilities. Case studies.

CVE 899: Master's Thesis Project 12 Units
Independent research and investigation of a problem in Civil Engineering, leading to M. Eng. thesis. Work consists of a theoretical analysis which may in some cases, be combined with experimental verification. It must demonstrate creative ability, originality and utility worthy of publication in recognized engineering journals. The candidate will be required to take an oral examination on completion, covering the field of their thesis and related topics.

CVE 999: Doctoral Research Project 24 Units
Independent research and investigation of a problem in Civil Engineering, leading to Ph. D thesis. Work consists of a theoretical analysis which may in some cases, be combined with experimental verification. It must demonstrate creativity ability, originality and utility worthy of publication in recognized engineering journals. The candidate will be required to take an oral examination on completion, covering the field of their thesis and related topics.

ACADEMIC STAFF LIST

S/N	NAME	POST	SPECIALIZATION
1	Prof. O. J. Oyedepo	Professor	Highway and Transportation Engineering
2	Prof. J. O. Afolayan	Professor	Structural Engineering
3	Prof. J. O. Babatola	Professor	Water Resources and Environmental Engineering
4	Prof. A. O. Owolabi	Professor	Highway and Transportation Engineering
5	Prof. C. Arum	Professor	Structural Engineering
6	Prof. L. M. Olanitori	Professor	Structural Engineering
7	Prof. O. O. Aderinlewo	Professor	Highway and Transportation Engineering
8	Prof. J. R. Adewumi	Professor	Water Resources and Environmental Engineering
9	Prof. O. S. Aderinola	Professor	Highway and Transportation Engineering
10	Prof. (Mrs.) B. D. Oluyemi-Ayibiowu	Professor	Geotechnical Engineering
11	Prof. (Mrs.) C. M. Ikumapayi	Professor	Structural Engineering
12	Dr. (Mrs.) O. M. Ojo	Reader	Water Resources and Environmental Engineering
13	Dr. O. G. Fadugba	Snr. Lecturer	Geotechnical Engineering
14	Dr. O. A. Obiora-Okeke	Snr. Lecturer	Water Resources and Environmental Engineering
15	Dr. S. L. Akingbonmire	Snr. Lecturer	Structural Engineering
16	Dr. A. I. Quadri	Snr. Lecturer	Structural Engineering
17	Dr. (Mrs.) H. I. Babalola	Snr. Lecturer	Construction Engineering
18	Dr. F. O. Ajibade	Lecturer I	Water Resources and Environmental Engineering
19	Dr. (Mrs.) T. F. Ajibade	Lecturer I	Water Resources and Environmental Engineering
20	Dr. O. O. Omotayo	Lecturer I	Structural Engineering

9.7.3 DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING

POSTGRADUATE DIPLOMA (PGD) PROGRAMME

1. PROGRAMME OFFERED

Post Graduate Diploma (PGD) (Industrial and Production Engineering)

2. PROGRAMME PHILOSOPHY

Through this programme, the department hopes contribute to the national and global industrialisation by providing opportunities for engineers and other related professionals with insufficient theoretical background in the Industrial and Production Engineering to do advanced work and to become graduates with strong academic and practical background in the subject.

3. OBJECTIVES OF THE PROGRAMME

The programme is designed to provide an opportunity for advanced professional education and training in Industrial and Production Engineering for:

i) those who wish to upgrade their technical knowledge in the profession without necessarily seeking advanced research-oriented degrees;
ii) those who wish to make up for the differences in their academic background to satisfy the requirements for the practice of engineering, and
iii) those who wish to bridge their academic career from practical-oriented Higher National Diploma course to the more theoretical research-based studies in the university and subsequently pursue higher degree courses in the University.

4. JUSTIFICATION FOR THE PROGRAMME

The programme is designed to enable, amongst others, successful candidate to attempt and pass relevant professional examinations to facilitate registration as a practicing professional engineer in Nigeria. Those who complete the PGD course with a minimum of 3.50 grade point average (Second Class Upper) and requisite qualifications as stipulated by Senate can also proceed to higher degrees. The PGD programme will enable HND graduates to further their education to higher degrees (Masters and PhD). The PGD programme also caters for the need of bridging the gap between HND and B.Eng. graduates to sustaining the continuity of OND/HND programmes in our Polytechnics.

5. ADMISSION REQUIREMENTS

Candidate seeking admission into PGD must possess the following requirements:

i. A first degree with at least a 3rd class grade in Industrial and Production Engineering, Mechanical Engineering, Electrical Engineering, and Mechanical Engineering and related science and engineering fields. In case of related engineering fields. The applicant must possess a minimum of Second-Class grade.
ii. HND with at least a Lower Credit pass in Industrial and Production Engineering, Mechanical Engineering, Electrical and Electronics Engineering and related engineering fields from a recognized Institution.

6. DURATION OF PROGRAMME

The programme shall be for a minimum of four (4) semesters (24 months).

7. REQUIREMENTS FOR GRADUATION

Each diploma student is required to successfully complete in four semesters, a minimum of 60 units of course works and 6 units of an independent project. The student must carry out an independent project/research and submit a report which will be defended in an oral examination. The external and University examiners will be appointed for the oral examination in line with the University practice.

8. COURSE OUTLINES

PGD - FIRST YEAR

FIRST SEMESTER

Course Code	Course Title	L	T	P	U
IPE 701	Engineering Mathematics	2	1	0	3
IPE 703	Robust Design for Process Improvement, Product Reliability and Testing	2	1	0	3
IPE 705	Materials and Inventory Management	2	1	0	3
IPE 707	Advanced Manufacturing Technology	2	0	3	3
IPE 709	Metrology	2	1	0	3
IPE 721	Concepts of Operations Research	2	1	0	3
	Total				18

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
IPE 702	Introduction to Ergonomics	2	1	0	3
IPE 704	Machining Processes	2	0	3	3
IPE 706	Control Systems	2	1	0	3
IPE 708	Welding & Joining	2	0	3	3
IPE 710	Decision Analysis in Engineering	2	1	0	3
IPE 712	Seminar	0	0	3	1
	Total				**16**

PGD – SECOND YEAR

FIRST SEMESTER

Course Code	Course Title	L	T	P	U
IPE 711	Machine Design	2	1	0	3
IPE713	Technical Report Writing and Presentation	2	1	0	3
IPE 715	Foundry Technology	2	0	3	3
IPE 717	Production Management	2	1	0	3
IPE 719	Engineering Metallurgy	1	0	3	3
	Total				**15**

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
IPE714	Engineer in Society	2	0	0	2
IPE716	Engineering Law and Management	3	0	0	3
IPE 718	Engineering Maintenance	2	0	3	3
	Elective				3
	Elective				3
IPE 799	Project	0	0	18	6
	Total				**20**

POOL OF ELECTIVE COURSES

Course Code	Course Title	L	T	P	U
IPE 720	Rapid Product Manufacturing	2	1	0	3
IPE 722	Supply Chain Management	2	1	0	3
IPE 724	Introduction to Total Quality Management	2	1	0	3
IPE 726	Fundamentals of Project Management	2	1	0	3
IPE 728	CAD/CAM	2	0	3	3
IPE 730	Fundamentals of Jigs and Fixtures Design	2	0	3	3

9. COURSE SYNOPSIS

IPE 70: 1 Engineering Mathematics (3 Units)

Real and complex analysis; Linear and partial differential equations; Review of Matrices: Equations and Application to real life problems, Eigen values, Eigen vectors and Canonical transformations and application; Vector Analysis: General Knowledge and Application; Ordinary and Partial Differential Equations; Complex Variables and Analytic functions; Numerical Analysis; Special Functions and Integral; Probability and Sampling; linear Programming; Polynomials, Roots of Equations, Remainder Theorem,

IPE 702: Introduction to Ergonomics (3 Units)

Basic principles of ergonomics in work environment applied to problems of worker and management. Topics include measurement of physical work capacity, problems of fatigue and heat stress, applied biomechanics, worker-machine interactions and communication, design of displays and controls.

IPE 703: Robust Design for Process Improvement, Product Reliability and Testing (3 Units)

Introduction to robust design for process improvement. Applications of design of experiments for product and process design optimization. Experimental design using factorial design and fractional factorial design. Robustness in design and quality improvement for complex systems including Taguchi methods and response surface methodology. Product assurance including reliability and quality engineering. Reliability design, measurement, and optimization. Advanced topics in probabilistic design. Design of reliability test plans and analysis of test data. Design of reliability programs and their management.

IPE 704: Machining Processes (3 Units)

Principles of Metal Cutting: Tool Materials, Tool Geometry (ASA, ORS Systems), mechanisms of chip formation, Cutting forces, cutting Temperatures, Tool wear and Tool life, Surface finish and machinability, optimization of cutting parameters, Tool path generation and machining principles, Setting and machining operations on metal cutting machine; lathe, milling, shaping, slotting, planning, drilling, boring, broaching, grinding (cylindrical, surface, centerless), thread rolling and gear cutting machines; Tooling: jigs and fixtures, principles of location and clamping; Batch production: Machining on capstan and turret lathes; Mass production: Machining on single/multi spindle automats, Finishing: micro finishing operations like honing, lapping, superfinishing.

IPE 705: Materials and Inventory Management (3 Units)

Introduction to Inventory Management; what is Inventory, Types of Inventory, Setting up the Warehouse, characteristics of Good Inventory Management System, the Warehouse Inventory Cycle, Plant Parameters Configuration, Disposal of obsolete, redundant and scrap items, Inventory Classification and Strategies, Codification, Standardization, Inventory Control Model, Effective Management of Spare Parts, Valuation of Inventory, Inventory Management Concept: Stockholding policies, Interface with other departments, Identifying Demand Material Receipt Process Validating Inventory, Maintaining Inventory Accuracy Delighting customers (Internal & External), Lean Supply; Control of stock range: categorization, standardization and variety reduction, addition and deletion of items; Stock Control Techniques; Independent and Dependent Demand (MRP, MRP2, DRP); Measuring Inventory Management Performance: Stores efficiency and effectiveness; Benchmarking; Stock Taking and Stock Audit.

IPE 706: Control Systems (3 Units)

Modeling of Dynamic System: Dynamic equations of mechanical (translational and rotational), electrical, electromechanical, hydraulic, thermal and pneumatic systems). Transfer function of control system components: Transfer function of mechanical devices (simple lever, compound lever, differential lever gyroscope, gears); electrical .and electronic circuits. (field-controlled and armature - controlled DC motor servo-motor, operational amplifier circuits), pneumatic components (bellows flapper - valve, relay, actuator): hydraulic components (valve, -linear actuator). Block diagram and linear graphs. Time-response analysis: Standard test signals (step, ramp or impulse signals) time response of first-order and second order systems: Steady-state errors and error constants. Frequency - response analysis: Nyquist and Bode plots - by sketching and use of experimental data. M - and N - Circles. (closed -loop frequency response). Analysis of system stability: Concept of system stability. Routh - - Hurwitz criterion and applications Nyquist stability criteria. Gain margin and phase margin. Relative stability

using Nyquist criterion. Root locus method: The root locus concept. Construction of roof loci. Interpretation of the root locus diagram. Introduction to systematic control design (system compensation): Need for system compensation.

IPE 707: Advanced Manufacturing Technology (3 Units)

Definition of advance manufacturing. Trends in advance manufacturing. Addictive Manufacturing Processes: Laser sintering, Electron Beam Melting, Selective Laser Melting, Direct laser metal deposition, wire arc additive manufacturing, Fused deposition modelling; inkjet printing; stereo lithography; laminated object. Welding Techniques: Friction stir welding; Laser beam welding; Surface Modification Technology; Laser metal deposition, PTA cladding, Thermal spraying, Plasma spraying; Electro-and electrolyses plating. Machining; Electro-discharge machining, CNC milling, CNC turning; Water jetting, Bio-manufacturing.

IPE 708: Welding & Joining (3 Units)

Metal joining processes: soldering, brazing, fusion and non-fusion welding processes, weldability, various modern welding processes like Tungsten Inert Gas Welding, Metal Inert Gas Welding, Submerged Arc Welding, Friction Welding, Laser Welding and Spot Welding. Welding defects. Welding configuration, determination of Welding Efficiency.

IPE 709: Metrology (3 Units)

Basic concepts: Definition of terms, calibration, standards, generalized measurement systems, static and dynamic performance characteristics; Analysis of experimental data; Instrumentation for measurement of position and displacement, force, pressure, velocity, temperature, proximity and range. Concept of feedback; Open and closed loop control systems, Transducers and devices for engineering applications, digital readouts, data acquisition and processing. Metrology: Standards, Slip gauges, Measurement of angles, tapers, threads, coordinates, inspection of straightness, flatness, alignment and surface finish, Gear Measurements, Measurements of various product features using Mechanical, Pneumatic, Optical and Electronic Instruments, Interferometry and use of optical flats.

IPE 710: Decision Analysis in Engineering (3 Units)

Multi-criteria decision tools involving qualitative and quantitative methods. Covers decision trees, subjective probability, utility and value theories, goals and objectives, risk, optimization, and simulation. Includes case studies in decision and systems analysis.

IPE 711: Machine Design (3 Units)

General considerations and procedure of Machine Design, Design stress, factor of safety, stress and deflection analysis, engineering materials and applications, fits and tolerances, design of fasteners and fastenings - pin, cotter, knuckle, screw, rivets and welded joints, design of shafts and couplings, common power and force transmitting power screws, belt drives and springs, pressure vessels and pipes.

IPE 712: Seminar (1 Unit)

IPE 713: Technical Report Writing (3 Units)

Principles of effective communication. Professional use of the English Language: Principles of technical writing. Oral presentation of technical ideals.

IPE 714: Engineers in Society (2 Units)

Philosophy of science. History of engineering and technology. Engineering professions and specializations. Engineering craftsmanship. Engineering training, institutions and post-training capacity building. Safety in Engineering and introduction to risk analysis. The role of Engineers in nation building. Invited lecturers by professionals in practice at an organized symposium

IPE 715: Foundry Technology (3 Units)

Casting: sand preparation, sand testing: specimen preparation, permeability, clay content, grain fineness number, green compression strength, green shear strength, dry strength, hardness. Characterization of materials - solids and fluids. Introduction to primary technology processes involving forging and casting, preparation of foundry sand and molds, Experiments on properties of post casting, fettling, and cleaning, deburring, polishing and painting operations. Surface preparation and etching techniques, heat treatment and metallographic studies.

IPE 716: Engineering Law and Management (3 Units)

Law, ethics and conduct in engineering. Legal definitions and specifications. Application of business law to engineering. Intellectual property. Industrial relations. Safety and environmental regulations. Technological responsibilities and reliabilities. Technology impact assessment. Court proceeding and Engineer as witness. Law management. Technological collaborations and innovation management.

IPE 717: Production Management (3 Units)

Management functions, Evolution of Management Theory, Management approach to Planning, Analysis and Control functions involved in a Production System; Production cycles, planning functions; Types of industry: Job, Batch, Continuous, Mass and Flow Productions; Organization and policies in respect of production planning and control; Product design and development; Forecasting techniques;

Scheduling, Sequencing and plant loading for optimal utilization; Queueing models and line balancing; Materials planning and Control, Value Analysis; Productivity Analysis, Mechanics of production control.

IPE 718: Engineering Maintenance (3 Units)

Introduction and types: Preventive maintenance, breakdown maintenance, Routine maintenance and condition-based maintenance systems. Proper assembly/ disassembly, alignment aspects, machine handling. Record keeping and maintenance scheduling, stocking spares and cost effectiveness, safety in maintenance. Basic repairs of electro-mechanical equipment, fault diagnosis and assessment. Condition base monitoring. Replacement/refurbishment of defectiveness machine parts. Fundamental principles; standards; techniques for quality analysis and improvements. Acceptance sampling; value engineering; ISO-9000 application. Quality control and reliability, hazard function. Poisson process. Weibull distribution. Series and parallel systems, non-series parallel systems, time- dependent systems, life-testing, sequential probability ratio test.

IPE 719: Engineering Metallurgy (3 Units)

Ferrous and Non-Ferrous Metals, Properties of Metals, Alloys and metal composites, wrought iron, steel and cast iron, Extraction of iron, Production of Steel, Nomenclature and classification of steels. Structure and properties of Metals (e,g steels). Heat treatments, Iron-carbon phase diagram, Corrosion of Metals, Application and processing of metals and alloys.

MEE 720: Rapid Product Development (3 Units)

Introduction to Computer Aided Design (CAD)/Computer Aided Manufacturing (CAM) through common database, introduction to solid modelling and the use of latest solid modelling CAD package (like Solid Works), STL(Stereo Lithography) devices, Overview of rapid product development and manufacturing, Rapid Prototyping & methods, Reverse Engineering, Rapid Tooling (theory and practice of a wide range of rapid tooling methods), Virtual Prototyping/computer simulation (Virtual and augmented reality), Design Analysis, High speed machining, Concurrent Engineering, Introduction to CNC, Optimization of NC programs through virtual machining.

IPE 721: Concepts of Operations Research (3 Units)

Linear Programming formulations, Simplex Methods, transportation and transshipment models, assignment model, sensitivity analysis, network models, shortest route problems, minimal/maximal flow problem. Dynamic programming, game theory, integer programming, using branch and bound technique, and goal programming. Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM) with application to project planning and control. Introduction to Quality, Reliability, Inventory, Queuing and Decision analysis models (Markovian, Bayesian, etc.). Introduction to Software packages in Operations Research.

IPE 722: Supply Chain Systems (3 Units)

The era of Physical Distribution Management, the Concept of Supply Chain, Channels Strategy and Alliances, the Changing Business Environment, Customer Focus in the Supply Chain, Achieving Customer Satisfaction Objectives, Transportation Choices in the Supply Chain, Inventory Management in the Supply Chain, Supply Chain Communications, International Supply Chain Management. Issues and Implications, Information for Supply Chain Management. Develop concepts related to the design, evaluation, and performance of supply chain systems through an exploration of contemporary practice and research, focusing on current issues, analytical frameworks, and case studies.

IPE 724: Introduction to Total Quality Management (3 Units)

Understanding quality, Inspection, Quality Control, Quality Assurance, commitment and leadership, design for quality, planning for quality, quality system requirements, quality measuring tools and the improvement cycle, ISO 9001, Six sigma, Kaizen, Balanced score card.

MEE 726: Fundamentals of Project Management (3 Units)

An Overview of Project Management. The Role of the Project Manager. Planning the Project. Developing a Mission, Vision, Goals, and Objectives for the Project. Using the Work Breakdown Structure to Plan a Project. Scheduling Project Work. Producing a Workable Schedule. Project Control and Evaluation.

IPE 728: CAD/CAM (3 Units)

Computer methods in industrial design, Advanced computer geometric modelling, transformations and projection, CAD/CAM databases, Introduction to automated machine tools and cutting tools, tool path planning, Management of cutting tools, Numerical control, Motion control, Robotics, CNC machine tools programming, use of modelling software.

IPE 730: Fundamental of Jigs and Fixtures Design (3 Units)

The Principle of Tool Design, Overview of Jigs and Fixtures, Jigs and Fixtures Supporting and Locating Principles, Jigs and Fixtures Clamping and Work holding Principles, Jigs and Fixtures Fabrication Fundamental. Jigs and Fixtures Economic Design Aspects- Variations and Applications of Angle Plate Jigs and Fixtures the design process of an Angle-Plate Jig, The Design Process of an Angle-Plate Fixture, overview of tool design application in Angle Plate Jigs and Fixtures

IPE 799: Project (6 Units)

This consists of an independent project with sound theoretical and investigative approach in a chosen area of Industrial and Production Engineering.

MASTER OF ENGINEERING
DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING

1. PROGRAMME OFFERED

Masters of Engineering -M.Eng. (Industrial and Production Engineering)

2. AVAILABLE OPTIONS / SPECIALIZATION

i. Engineering Management
ii. Manufacturing Process Engineering
iii. Industrial and Systems Engineering

3. PROGRAMME PHILOSOPHY

According to the Global Competitiveness Report published by the World Economic Forum in 2018, Nigeria occupied the 116th position out of 140 countries. This backwardness is as a result of the problems facing the nation's manufacturing and industrialization. The philosophy of the programme is to develop and build human potentials through higher degree or studies in industrial, production and manufacturing engineering or related areas that will increase gross domestic product (GDP) of Nigeria and by extension, the entire world. The programme intends to increase engineering, technological and scientific innovations in the areas of manufacturing process engineering, industrial and systems engineering and engineering management.

4. OBJECTIVES OF PROGRAMME

The programme is designed to achieve the following objectives which are to:

i. provide advanced academic courses for students who desire to undertake further studies and research in different areas of Industrial and Production Engineering including manufacturing process engineering, industrial and systems engineering and engineering management.

ii. produce engineering professionals and other high-level manpower that are equipped with necessary industrial, production and management skills and training to meet the contemporary demands in the manufacturing industry, research institute, government establishments and higher institution of learning in Nigeria and the entire globe.

5. JUSTIFICATION FOR THE PROGRAMME

The programme is required to enable, amongst others, training of high-level manpower that are

needed in ever increasing higher institutions and research institutes globally. M.Eng. degrees in the core areas of industrial and production engineering are required to cater for the immediate and future need of many Universities globally as they continue to establish Industrial and Production Engineering programme. The higher degree (M.Eng.) will cater for the shortage of high-level manpower required in the Universities and Research Institutes in the nearest future. The higher degree will also enable human capital development in the areas of Industrial and Production Engineering through:

i. Localisation of modern strategies to enhance maintenance practice and entrepreneurial development.
ii. Machine development and automation to support entrepreneurial development.
iii. Application of modern Industrial and Manufacturing engineering techniques to create employment and wealth.
iv. Mitigation of challenges that are hindering productivity and performance of industries.

6. ADMISSION REQUIREMENTS

Candidate seeking admission into M.Eng programme, candidates must satisfy the following requirements:

i) a bachelor degree in Industrial and Production Engineering and other related engineering fields at least a second-class lower division from either The Federal University of Technology Akure (FUTA) or any other recognized University that runs COREN-accredited programmes.
ii) candidates with PGD in Industrial and Production Engineering and other related Engineering fields, with at least CGPA of 3.0/5.0.

7. DURATION OF PROGRAMME

The M. Eng. programme consisting of course work and research will normally last a minimum period of 18 months but not more than 24 months on full time basis.

8. REQUIREMENTS FOR GRADUATION

In order to be awarded the M. Eng. degree, a candidate must successfully:

i. pass all courses selected from a buffet of course as specified in the course synopsis;
ii. present and pass two seminars based on a 12-credit load supervised thesis;
iii. submit the required number of copies of thesis;
iv. present proof of submission of a minimum of one journal manuscript publication; and
v. pass the oral examination of the submitted thesis.

9. COURSE OUTLINES

i. Engineering Management/Operations Research Option

FIRST SEMESTER

Course Code	Course Title	L	T	P	U
IPE 801	Lean Manufacturing	2	1	0	3
IPE 803	Supply Chain Management	2	1	0	3
IPE 805	Engineering Economics	2	1	0	3
IPE 807	Design of Operation Facilities	2	1	0	3
IPE 829	Advanced Concepts of Operations Research	2	1	0	3
*	Elective				3
	Total				**18**

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
IPE 802	Industrial Statistics & Experimental Design	2	1	0	3
IPE 804	Project Management	2	1	0	3
IPE 806	Total Quality Management	2	1	0	3
IPE 808	Marketing and Service Management	2	1	0	3
**	Elective				3
	Total				**15**

THIRD SEMESTER

Course Code	Course Title	L	T	P	U
IPE 821	Research Methods and Presentation	1	1	0	2
IPE 899	Master's Thesis Research Project	0	0	36	12
	Total				**14**

ii. Manufacturing Process engineering option

FIRST SEMESTER

Course Code	Course Title	L	T	P	U
IPE 801	Lean Manufacturing	2	1	0	3
IPE 809	Advanced Manufacturing Techniques	2	0	3	3
IPE 811	Rapid Product Development	2	0	3	3
IPE 813	Computer Integrated Manufacturing (CIM)/Flexible Manufacturing	2	0	3	3
IPE 829	Advanced Concepts of Operations Research	2	1	0	3
*	Elective				3
	Total				**18**

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
IPE 802	Industrial Statistics & Experimental Design	2	1	0	3
IPE 810	Properties & Performance of Engineering Materials	2	0	3	3
IPE 812	Joining Technologies	2	0	3	3
IPE 814	Robotics and manufacturing automation	2	0	3	3
**	Elective				3
	Total				**15**

THIRD SEMESTER

Course Code	Course Title	L	T	P	U
IPE 821	Research Methods and Presentation	1	1	0	2
IPE 899	Master's Thesis Research Project	0	0	36	12
	Total				**14**

ii. Industrial and Systems Engineering Option

FIRST SEMESTER

Course Code	Course Title	L	T	P	U
IPE 801	Lean Manufacturing	2	1	0	3
IPE 807	Design of Operation Facilities	2	1	0	3
IPE 815	Systems Modelling and Optimization	2	0	3	3
IPE 817	Automation, CNC Machines and Robotics	2	0	3	3
IPE 829	Advanced Concepts of Operations Research	2	1	0	3
*	Elective				3
	Total				**18**

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
IPE 802	Industrial Statistics & Experimental Design	2	1	0	3
IPE 816	Simulation Methods and Applications	2	0	3	3
IPE 818	Instrumentation and Control	2	0	3	3
IPE 820	Engineering of Systems	2	0	3	3
**	Elective				3
	Total				**15**

THIRD SEMESTER

Course Code	Course Title	L	T	P	U
IPE 827	Research Methods and Presentation	1	1	0	2
IPE 899	Master's Thesis Research Project	0	0	0	12
	Total			36	**14**

***First Semester Elective Courses for ALL options**

****2nd Semester Electives Courses for ALL options**

Course Code	Course Title	L	T	P	U
IPE 819	Organizational Leadership and Culture	2	1	0	3
IPE 821	Design and Analysis of Joints	2	1	0	3
IPE 823	Machine Tools System	2	0	3	3
IPE 825	Reliability Engineering and Plant Maintenance	2	1	0	3

Course Code	Course Title	L	T	P	U
IPE 822	Applied Occupational Health & Safety, and Safety Problems in Industry	2	0	3	3
IPE 824	Warehouse Management and Distribution Network	2	1	0	3
IPE 826	Tribology and Terotechnology	2	1	0	3
IPE 828	Inspection and Testing for Quality Assurance	2	1	0	3

10. COURSE SYNOPSIS

M. Eng. Course Synopsis

IPE 801: Lean Manufacturing (3 Units)

Introduction to lean management principle, lean manufacturing techniques, lean management, Lean Manufacturing Tools and Techniques, Lean Supply Chain Management, Lean Six Sigma in Manufacturing and Service, Lean Product Design and Development, Total Productive Maintenance, set of core lean management principles, tools, and techniques,

IPE 802: Industrial Statistics & Experimental Design (3 Units)

The Art of Experimentation, Introduction to Design of Experiment - DOE (What is experimental design? Why use DOE? DOE key concepts: Interactions, Coding, Confounding/aliasing, Robustness, Randomization), Simple Designs and Their Analysis (DOE step checklist example, Calculating effects, Interaction plots, Marginal means plot of effects, Pareto chart of effects, Prediction equations, Using Excel based DOE KISS software & other packages), Design Types: Full factorial designs & Fractional factorial designs (Design resolution, Aliasing pattern, Fold-over), Response Surfaces Methodology Plackett-Burman designs, Box-Behnken designs, Box-Wilson (central composite) designs , Taguchi designs and optimization. Practice Conducting and Analysing Experimental Data: Multiple regression, Normal probability plot, Importance of analysing interactions, Taguchi's signal to noise ratios, Variance reduction analysis, and Practice planning, executing, and analysing an experiment. Statistical modelling and control in manufacturing processes. Use of experimental design and response surface modelling to understand manufacturing process physics. Defect and parametric yield modelling and optimization.

IPE 803: Supply Chain Management (3 Units)

Definition of Supply Chain and Supply Chain Management; Introduction to business logistics; Competitive advantage created by logistics; Logistics and supply chain strategy; Tactical logistics management and supply chain integration; Financial aspects of logistics and supply chain management; Forecasting and demand management; Network

integration; Introduction to production and operations management (Just-in-time and Materials Requirements Production); Procurement management; Inventory management; Facility location and design; Packaging and containers; Warehouse operations; The transport system and management; Transport costing and structure; Managing international supply chain (import and export management); Reverse logistics and investment recovery; and Controlling logistics performance.

IPE 804: Project Management (3 Units)

What is project? Types of projects; when is project successful? Definition of Project Management; Project Management life Cycle; Roles of a Project Manager, Project Planning and Scheduling; Gant Charting; Network diagram; Critical Path Method (CPM), Project Evaluation Review and Techniques (PERT). Estimating Costs and Budgeting; Costing Methodologies; Contingency fund; resource allocation and smoothing. Project Control and Monitoring; Earn Value Analysis; Project risk identification and management. Project Selection Process: Project Investment Appraisal; Contents Project proposal; Tendering of contract; typical clients' worries. Behavioural issues during project execution.

IPE 805: Engineering Economics (3 Units)

Fundamental concepts and advanced techniques of engineering analysis; evaluation of alternative capital investments considering income taxes, depreciation and inflation; discounted cash flow analysis of competing projects, buy or make decision, break-even analysis and determination of rate of return on investment. Risk and uncertainty in engineering analysis.

IPE 806: Total Quality Management (3 Units)

Definition of quality and quality management. Quality and Three Fs – Fit, Form and Function. Fitness for use, fitness for purpose. Concept and goals of TQM. The eight building of TQM. Prerequisites for success for TQM. Cost of Quality, 5S of housekeeping. TQM pioneers. Eleven TQM steps to be a world-class organisation. Deming's seven deadly disaster. Deming's 14 points to reach world-class performance standard. Quality circle. Seven deadly tools: Stratification, Check sheet; Scatter diagram; Histogram; Ishikawa Diagram; Pareto Diagram; Control Chart. TQM practices. Total productive maintenance: Effect of poor maintenance; Cause of machine failures; Focus on TPM. Features on TPM.

IPE 807: Design of Operation Facilities (3 Units)

Location and Site selection, Facility design stages, processes, material handling equipment and analysis, Area allocation and space requirements, Flow analysis, fabrication of individual parts, total plant flow, Plant layout, Utilities Layout, Computerized facility layout and location, layout algorithms like CRAFT, ALDEP, CORELAP etc, Strategies for storages.

IPE 808: Marketing and Service Management (3 Units)

What is strategic marketing? A review of essential marketing theory. Marketing as exchange. Marketing as a relationship builder. Customers' values and satisfaction. Marketing Environment (Internal and external environment). How can organisations respond to the marketing environment? Product and services: Characteristics. Major tasks of industries. What is service quality? Managing Service quality. Gaps Models of Service Quality. Applying gaps model of service quality to an engineering service firm. Interactions, networks and service process. Market demand and forecasting. Marketing Mix and Marketing Mix Strategy. Branding and Brand strategy in engineering service enterprise.

IPE 809: Advanced Manufacturing Techniques (3 Units)

Digital/Additive manufacturing, Advanced machining theory & practices (mechanisms of chip formation, shear angle relations, and theoretical determination of cutting forces in orthogonal cutting; analysis of turning, drilling, and milling operations; mechanics of grinding; dynamometry; thermal aspects of machining; tool wear; economics of machining; processing of polymers, ceramics, and composites), Advanced machining processes (introduction of ultrasonic machining -USM, Abrasive jet machining - AJM, Water jet machining – WJM, Abrasive water jet machining - AWJM, Electrochemical machining - ECM, Electro discharge machining - EDM, Laser beam machining - LBM, and Electron beam machining - EBM), Advanced forming

processes (electro-magnetic forming, explosive forming, electro-hydraulic forming, stretch forming, contour roll forming), Advanced welding processes (electron beam welding - EBW, laser beam welding - LBW, ultrasonic welding - USW), Advanced foundry processes (metal mould, continuous, squeeze, vacuum mould, evaporative pattern, and ceramic shell casting).

IPE 810: Properties & Performance of Engineering Materials (3 Units)

Introduction to Engineering materials, properties of materials, structure of crystalline solids/metals, Imperfections in Solids, Phase diagrams, Phase transformations, Mechanical properties of metals, the relationship between stress and strain in the elastic regime, the theories of plasticity and failure (physics of plastic deformation and its interaction with the microstructure), Dislocations and strengthening mechanisms of metals (grain refining, alloying with interstitial and substitutional solutes, precipitates, second-phase, etc), contemporary approaches towards modelling the strain hardening behaviour, fundamentals of materials characterization and failure analysis/metal failure

For polymers: the temperature dependence of mechanical properties, and failure mechanisms (such as yielding, crazing, creep and stress rupture), Time-dependent viscoelastic response of polymers (from Kelvin, Maxwell, Zener, and four parameter models), Curve fitting of relaxation stresses (using Prony series), Boltzmann superposition principle, time-temperature superposition principle, Rubbers with nonlinear elastic stress-extension characteristics

IPE 811: Rapid Product Development (3 Units)

Introduction to Computer Aided Design (CAD)/Computer Aided Manufacturing (CAM) through common database, introduction to solid modelling and the use of latest solid modelling CAD package (like Solid Works), STL(Stereo Lithography) devices, Overview of rapid product development and manufacturing, Rapid Prototyping & methods, Reverse Engineering, Rapid Tooling (theory and practice of a wide range of rapid tooling methods), Virtual Prototyping/computer simulation (Virtual and augmented reality), Design Analysis, High speed machining, Concurrent Engineering, Introduction to CNC, Optimization of NC programs through virtual machining,

IPE 812: Joining Technologies (3 Units)

Fusion Joining Technologies GMAW, GTAW, PAW, SAW and their variants like P-GTAW, A-GTAW, hot wire GTAW, P-GMAW, FCAW, Narrow gap welding -NGW). Resistance welding (Fundamentals of resistance welding, spot, seam, protection, HF induction and resistance welding, flash-butt, stud welding). principle, process parameters and performance of joints by LBW, EBW, selection of power density and scanning speed in LBW, vacuum for EBW, application and limitation of radiation-based welding process). Other processes (Fundamentals, principles, parameters and joint performance of Electroslag welding - ES/GW, brazing and soldering, thermite welding, cutting, weld surfacing). Solid State Joining Technologies (Fundamentals: Introduction, feasibility and applications, comparison with fusion joining technologies, principles of solid state joining, metal properties and weldability by solid state joining, weld and heat affected zone, deformation and its effect on microstructure and properties of weld and HAZ). Macro-deformation-based joining. Micro-deformation-based joining. Diffusion based joining, Adhesive joining. Hybrid Joining Technologies such

IPE 813: Computer Integrated Manufacturing (CIM)/Flexible Manufacturing (3 Units)

Introduction to CIM (Type of Manufacturing System, Elements of CIM, Automation and CAD/CAM), Concurrent Engineering, Manufacturing System (Group Technology (GT), Process Planning, Production Planning and Control), Fundamental of CAM (Numerical Control (NC), Control Systems of the NC Machine Tool, Adaptive Control, Sensors for Computer, Controlled Machine Tool, NC Part Programming), Material Handling and Storage (Automated Material Handling, Analysis for Material Handling System, Automated Guided Vehicle System, Automated Storage System, Automated Storage/Retrieval System, Applications), Flexible Manufacturing Systems (FMS Workstation, Material Handling and Storage System, Computer Control System, Planning the FMS, Analysis Methods for FMS, Applications), Numeric Control and Robots (Numerical Control, Industrial Robotics, Programmable Logic

Controllers), Material Requirements Planning (MRP) (Objectives of MRP, Basic Concepts and Inputs to MRP, Bill of Material (BOM), How MRP works?), Shop Floor Control (SFC) (Functions of SFC System, Operation Scheduling, Priority Rules for Job Sequencing), Just-In-Time (JIT) (Introduction, Prerequisites for JIT, Elements of JIT, Toward Eliminating Inventories in JIT System), Implementation of CIM.

IPE 814: Robotics and Manufacturing Automation (3 Units)

Introduction to robotics, Robot Theory, Object Location, Manipulator Position, Kinematic Repetition, Shop Floor Toolkit demo together with Hexagon, Enterprise Robotics, Parallel Kinematics, Advanced Simulation, Industry 4.0 Internet of things, Digital Factory in Aerospace Industry, Collaborative Robots,

The basics of industrial automation systems especially flexible manufacturing. Industrial robotics technology including sensors and sensor systems. Mechanical structure, drives, precision and repeatability of an industrial robot. The use of industrial robots. Programming of industrial robots. Simulation tools for offline programming of industrial robots. Integration in production systems. Production within industrial networks. PLC programming. Safety aspects of automation. Economic, engineering, and work environment-related issues with robotic automation. Sustainable development from an automation perspective.

IPE 815: Systems Modeling and Optimization (3 Units)

Modeling and optimization techniques used in solving problems encountered in industrial and service systems. Topics include deterministic and stochastic modelling methodologies (e.g., linear and integer programming, Markov chains, and queuing models) in addition to decision analysis and optimization tools. These techniques will be applied to application areas such as production systems, supply chains, logistics, scheduling, healthcare, and service systems.

IPE 816: Simulation Methods and Applications (3 Units)

Fundamental methodologies of simulation modelling; random number and variate generation, statistical analysis of model output, and discrete event modelling using a commercial simulation language. Selection of optimal locations of industrial plants and distribution centres through analytical modelling of the costs of the costs of inventory storage, transportation, utilities, labour supply and other cost components.

IPE 817: Automation, CNC Machines and Robotics (3 Units)

Basic principles of automation; Extending the capabilities of conventional machines through improved devices and manipulators; Basic principles of numerical control; CNC, DNC and Machining Centres; Methods of coding and programming; APT programming; Adaptive control; Economics of numerical control. Introduction to Robotics: Synthesis of elements with movability constraints; Elements of robot anatomy; Hydraulic, pneumatic and electrical manipulators; End-effectors and their design; Controllers with microprocessors or fluidics; Robot Sensors; Applications of industrial robots; Economics of robotics.

IPE 818: Instrumentation and Control (3 Units)

Basic concepts, characteristics, functions of instruments especially for indicating and recording, length, weight, volume, temperature, pressure, flow level, etc. Measuring errors and calibration.

Introduction to the principles of automatic control systems encountered in Mechanical Engineering; Open-loop and closed loops systems. Control Modelling: Block diagrams, transfer functions, Laplace transforms, root locus, Bode diagram Frequency response. Design parameters: Response Time, relative stability, Overshoot, settling time etc. Classical control systems modelling Temperature, speed, level, flow, proportional, integral and derivative controls, mode of operation of hydraulic, pneumatic, and electrical components, amplifiers servomotors, process controllers, regulating valves, position transducers, Programmable Logic Controllers.

IPE 819: Organizational Leadership and Culture (3 Units)

The Concept of organization culture and behaviour. Identifying the fundamental aspects of organizational dynamics; Discussing the aspects of Individual Behaviour in Organizations; presenting the aspects of Groups and Group

Dynamics; Highlighting and discussing Organizational Structure and Culture; Describing Leadership Theories and Leadership Behaviour (Styles); Discussing Organizational Change and Development; and Human Performance and Organizational Behaviour Understanding Rewards in Organization.

IPE 820: Engineering of Systems (3 Units)

Identification of value and the value chain requirements, management and engineering, understanding the limitations of current systems, the development of the overall concept, and continually improving the robustness of the defined solution. Creation of systems that generate value for both the customer and the enterprise. Through systematic analysis and synthesis methods, novel solutions to problems are proposed and selected. Definition of the system requirements by systematic analysis of the existing problems, issues and solutions. Creation of an improved vision for a new system. Based on this new vision, new high-level solutions will be identified and selected for (hypothetical) further development. The focus is to learn systems engineering through a focus on an actual artefact.

IPE 821: Design and Analysis of Joints (3 Units)

Introduction to design, engineering properties of steels, weldability of structural steels, tensile, impact, fatigue and creep properties of welded joints, theories of failures. Basic terms: Type of welds and weld joints, description of welds terminology, welding symbols, edge preparation, sizing of welds in structure, type of connections in welded structures, combined groove and fillet weld connections. Design for Static Loading: Weld calculations for lap, butt and fillet welds. Design for Fatigue loading: Mechanism of fatigue fracture, residual fatigue strength, factors affecting fatigue life, design of welded joints for fatigue loading, reliability analysis and safety factors applied to fatigue design. Industrial Applications of Weld Design: Design of tubular structure, circular and rectangular hollow sections under static loading; design of weld joint for pressure vessel and automobile applications; design of brazed and soldered joints. Heat flow in Welding: Effect of welding parameters on heat distribution, calculation of peak temperature, weld thermal cycle, cooling rate and solidification time, residual stresses in weld, stress corrosion.

IPE 822: Applied Occupational Health & Safety, and Safety Problems in Industry (3 Units)

Application of occupational safety and health principles. Student teams perform evaluations, assess production methods/processes and exposures, health and safety procedures and programs, and develop engineering and administrative controls. Students perform on a consulting project with a local company including budgeting, project reporting, and presentation. Develops skills in occupational health and safety hazard recognition in a variety of important industries. Focuses on process understanding and hazard recognition skills during walk-through inspections of several local facilities, stressing a multidisciplinary approach.

IPE 823: Machine Tools Systems (3 Units)

Principles of generation of various surfaces in Machine Tools; Conformable kinematic synthesis for tracing, forming, enveloping and generation; kinematics structure of geared and step-less drives for machines; designing discrete step drives for machine tools speeds and feeds; Step-less drives; Design principles of machine tool gear boxes; Hydraulic and Electric drives and control; Machine-tool structures: principles of design. Machine Tool vibration and stability control. Principles of design of Machine Tool elements like bearings, spindles and slides; Automation and Control features of Machine Tools; Special tools and attachments. Elements of unit-built machines and Transfer
Lines; Selection and acceptance testing of machine tools.

IPE 824: Warehouse Management and Distribution Network (3 Units)

Warehousing and Physical Distribution; Location of Function on the Organization Chart; Need for Warehousing and Physical Distribution; Inventory as Working Capital; Stockholding costs and its Influences; Functions of Warehousing; Storage of Materials, FIFO / LIFO-Layout-Identification-Bar-coding; Maintaining Inventory Accuracy, Stocktaking-Cycle Counting-Technology; Warehouse Safety; Measuring Effectiveness and Efficiency.

IPE 825: Reliability Engineering and Plant Maintenance (3 Units)

Reliability: Definition and basic concepts; Failure data, failure modes, and reliability in terms of hazard rate and failure density function; Hazard models and bath tub curve; applicability of Weibull distribution. Reliability

calculations for series, parallel and parallel-series systems; Reliability calculations for maintained and stand-by systems. Maintenance - its role and scope in total organizational context. Objectives and characteristics of maintenance; basic guidelines for design of organization structure for maintenance; Centralized vs decentralized maintenance; Types of maintenance - corrective, planned, preventive and predictive maintenance; Factors affecting maintenance; opportunistic maintenance; Measurement of maintenance work; rating and allowances. Maintenance cost budgets. Maintenance planning and scheduling; MIS in maintenance; Measurement of maintenance effectiveness and maintenance audit.

IPE 826: Tribology and Terotechnology (3 units)

Introduction to tribological systems and their characteristic features: Physico-mechanical interactions at interfacial contact surfaces; Analysis and assessment of topography; Deterministic and stochastic tribo-models for asperity contact, frictional resistance and wear; Models of aheso-diffusion wear process; Kinetics of solid-state interfacial interactions. Principles of lubrication: Hydro-dynamic, hydro-static, elatso-hydrodynamic cases; Boundary film lubrication; Solid lubricants; Tribological design of machine elements and systems; Principles of life-cycle analysis and their application. Terotechnology: Introduction, Life cycle cost analysis of plants and concept of tero-technology; Various maintenance management strategies; Production maintenance interface and terotechnology based planning and control; Maintenance policy determination; Fixed time replacement prior to failure; Concept of health and usage monitoring of plants (HUM); Condition based maintenance; Opportunity maintenance; Design out maintenance; Preventive maintenance; Reliability, maintainability and availability of plants and equipment; Replacement strategies, Computer application in terotechnology based critical analyses.

IPE 827: Research Methods and Presentation (2 Units)

The nature and purpose of research; different types of research (quantitative qualitative, mixed methods, developmental, practice based). Identifying a research topic and setting research objectives; developing a research strategy; characteristics of a good research project; ethical issues in conducting research. Searching and Reviewing the Literature. Approaches to data collection and analysis (quantitative, qualitative, mixed-methods, iterative); questionnaire design; populations, samples, and sampling methods. Writing research proposal; analysis of data and finding trends in data. Use of statistical tools. Referencing. Results presentations.

IPE 828: Inspection and Testing for Quality Assurance (3 Units)

Introduction to types and purposes of weld joint testing, important terms in joining, symbols for welding and testing. Discontinuities in Weld Joints (Classification of discontinuities in weldments, occurrence, causes and prevention of discontinuities, location, orientation and extent of discontinuities). Destructive Testing (DT): Chemical tests, metallographic tests, hardness tests, mechanical test for groove and fillet welds of full section, reduced section and all weld-metal tensile tests, root, face and side bend tests, fillet weld break tests, fillet weld shear strength test. Non-Destructive Testing (NDT): Visual inspection, dye-penetrant test, magnetic particle testing; Ultrasonic testing- principle of ultrasonic testing, types of ultrasonic probes, standard blocks for calibration; Radiographic inspection – principle of radiography, X-ray tubes, Gamma-ray sources, interpretation of radiographs, defect discernibility, Eddy current inspection; Proof test, leak tests: NDT, AWS (American Welding Society) standards, safety in NDT. Inspection of Weld Joints: Duties and requirement of an inspector before, during and after welding, codes governing welding inspection, ASME (American Society of Mechanical Engineers) Codes. Welding Procedure and Performance Qualifications.

IPE 829: Advanced Concepts of Operations Research (3 Units)

Linear Programming formulations, Simplex Methods, concept of duality, transportation and transshipment models, assignment model, sensitivity analysis, network models, shortest route problems, minimal/maximal flow problem. Dynamic programming, Game theory, Integer Programming, using branch and bound technique, and goal programming. Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM) with application to project planning and control. Project crashing and Resources (Manpower, Material, Machine, Money, etc.) leveling, Probability theory. Quality, Reliability, Inventory, Queuing and Decision analysis

models (Markovian, Bayesian, etc.). Fundamental concepts of simulation. Non-linear Programming (geometry, quadratic, convex, etc). Introduction to Software packages in Operations Research. Case study in Operations Research. Operations Research Software development and applications.

IPE 899: Master's Thesis Research Project (12 Units) Independent engineering project demonstrating professional maturity, performed under at least one supervisor, who is a senior academic staff.

DOCTOR OF PHILOSOPHY
DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING

1. PROGRAMME OFFERED

Doctor of Philosophy -Ph.D. (Industrial and Production Engineering)

2. AVAILABLE OPTIONS / SPECIALIZATION

i) Maintenance Engineering
ii) Advanced Manufacturing Engineering
iii) Industrial Systems Design and Optimization
iv) Engineering Management

3. PROGRAMME PHILOSOPHY

The philosophy of the programme is conceived to equip student with the spirit of enquiry, instill discipline, independence, originality of thought and problem-solving techniques and to develop highly skilled engineers and professionals that are intellectually sound with modern knowledge-based in Industrial, Production, and Management Engineering.

4. **OBJECTIVES OF THE PROGRAMME**

The programme is designed to provide an opportunity for advanced professional and academic training in Industrial and Systems Engineering, Advanced Manufacturing and Maintenance, Welding and Fabrication Engineering, Machine Design and Development, and Human Factor and Industrial Safety Engineering for:

i) those who wish to improve their professional and academic knowledge through seeking advanced research-oriented degrees in the stated areas;
ii) those who are professional lecturers in higher institution and/or researchers in reputable research institutes and wish to advance his/her knowledge to satisfy the requirements for the teaching and practice of advanced engineering, and
iii) those who wish to learn how to carryout advanced researches in core areas of the Industrial and Production Engineering fields.

5. **JUSTIFICATION FOR THE PROGRAMME**

The programme is required to enable, amongst others, training of high-level manpower that are needed in ever increasing higher institutions and research institutes in nationally and internationally. More Ph.D. degrees in the core areas of industrial and production will be required soonest, as many Universities in Nigeria and Abroad are continuing to establish programmes in the field of Industrial and Production Engineering, therefore, the higher degrees programmes (M. Eng. and Ph.D.) will cater for the expected high level manpower requirement deficit in the Universities and Research Institutes in the nearest future. Other justifications of offering Ph.D. degree programme in the core areas of the Industrial and Production Engineering are to enable:

i. Localisation of modern strategies to enhance maintenance practice and entrepreneurial development.
ii. Machine development and automation be directed towards the need of the immediate

and remote communities to support entrepreneurial development.

iii. Modern welding and fabrication engineering address the need of the immediate and global communities and supportive to employment and wealth creation.

iv. Mitigation of challenges that are hindering survival of production industries, in terms of productivity and performance.

6. ADMISSION REQUIREMENTS

To be qualified for admission into the PhD programme, candidates must satisfy appropriate requirements as stated below:

i) An M. Eng. degree in Industrial and/or production engineering and other related engineering fields with a minimum score of 60% or 3.5/5.0 from either FUTA or any other recognized university that runs COREN-accredited Engineering programmes; and obtained the qualifications tenable for admission into M.Eng. programme in Industrial and Production Engineering Department of School of Engineering and Engineering Technology, FUTA, is eligible to do the Ph.D. programme,

ii) a candidate with M.Eng. in other related Engineering fields will be required to take a minimum of 12 units in their area of proposed research to be admitted for Ph.D program in Industrial and production engineering.

7. DURATION OF PROGRAMME

The PhD programme is a research study lasting for a minimum period of 36-48 months full time or 48-60 months part-time students and may include course work.

8. REQUIREMENTS FOR GRADUATION

In order to receive the Ph.D. degree, candidate must carry out an independent research work in his specialization under the general supervision of selected senior academic staff in the chosen field of research. The candidate must demonstrate high scholastic ability through the research work. The dissertation emanating from the research should exhibit originality and the result must form distinct contributions to knowledge. In carrying out this main requirement, a candidate must observe the following:

i. a candidate must, in consultation with his supervisors, present a comprehensive research proposal and a proposal seminar in the department and school successfully within the first year of study;

ii. as in c(i), a candidate must present a progress report and seminar in the department and school successfully;

iii. on completion of the research work, the candidate must present an end -of- thesis seminar successfully in the department and school;

iv. a candidate must present proof of minimum of two journal publications; and

v. a candidate, after carrying out satisfactory post seminar review, must submit the required number of copies of thesis for oral examination; and pass satisfactorily the examination of the submitted thesis.

9. COURSE OUTLINES

IPE 999: Doctoral Research Project

10. COURSE SYNOPSIS

This should consist of an independent work with sound theoretical and investigative approach in any of the following areas.

i. **Maintenance Engineering** – E-maintenance, S-Maintenance; Terotechnology; Total Quality Maintenance (TQM); Advanced maintenance optimisation models and development of localisation strategies to enhance maintenance practice and entrepreneurial development

ii. **Advanced Manufacturing**– Lean Manufacturing, agile manufacturing additive manufacturing, joining technology; casting; materials development, characterization and testing; surface engineering; computer integrated and Flexible Manufacturing. Localisation of advanced manufacturing techniques to enhance manufacturing practice and entrepreneurial development

iii. **Industrial Systems Design and Optimization** – Industry 4.0, digital twin technology, Machine Learning; ergonomics, production and operations systems design and optimisation. Industrial systems design and optimisation should focus on mitigating challenges that are hindering industrial productivity in our immediate and global environments

iv. **Engineering Management**- project management, operations management, production management, project crashing, resources leveling, advanced PERT and CPM of project scheduling and implementation, project feasibility and costing, investment analysis, modern issues in engineering management (economic, political, social, cultural, etc. issues) should be address. Engineering management should focus on mitigating challenges that are hindering survival of works and projects in our immediate and global environments.

v. **Operations Research**- Linear and non-linear optimisation techniques to optimisation of industrial operations and production processes. Deterministic and stochastic processes, Logistics and transportation model, Decision analysis-Markovian decision process, Queuing model, Bayesian optimisation techniques, and modification of these models for an improved system optimisation based on modern and environment realities should be the focus. Operations Research should focus on mitigating challenges that are hindering survival of production industries in our immediate and global environments.

10. ACADEMIC STAFF

S/N	NAME	RANK	QUALIFICATION	E mail	AREAS OF SPECIALISATION
1.	Prof. B.O. Akinnuli	Professor	B.Eng., M.Eng., Ph.D. (Akure), MNSE, MMSN, MNIEM, COREN Rgd.	boakinnuli@futa.edu.ng	Industrial Engineering, Engineering Management, Operation Research, Modelling, and System Optimisation
2.	Prof. B. Kareem	Professor	B.Eng., M.Eng., Ph.D. (Akure), MNSE, MMSN, FNIEM, MIAENG (SIE &SOR), MAASCIT, MWASET, FIMPD, COREN Rgd.	Bkareem@futa.edu.ng	Industrial and Systems Engineering, Operations Research, Modelling, Maintenance Engineering and Systems Optimisation
3.	Prof. P.K. Oke	Professor	B.Eng. (Ado), M.Eng., Ph.D. (Akure) MNSE, MMSN, MNIEM, COREN Rgd.	pkokde@futa.edu.ng	Machine Design, Industrial and Production Engineering, Engineering Management
4.	Prof. S. P. Ayodeji	Professor	B.Eng., M.Eng., Ph.D. (Akure), FNSE, MMSN, MNIEM, COREN Rgd.	spayodeji@futa.edu.ng	Production Engineering, Advanced Manufacturing Technologies, Applied Ergonomics, Industrial System Optimization, Machine and Process Design

5.	Prof. O.O. Awopetu	Professor	BSc MSc (Combined) (Volgorad), Ph.D. (Akure)., MNSE, MMSN, MNIEM, COREN Rgd.	ooawopetu@futa.edu.ng	Applied Manufacturing Technology, Machine Tools, Cutting Tools, Engineering Maintenance.
6.	Prof. P. B. Mogaji	Professor	HND(Ibadan), PGD(Akure), M.Eng., Ph.D. (Akure), MNSE, MMSN, MNIEM, COREN Rgd.	pbmogaji@futa.edu.ng	Manufacturing Engineering, Production Management, Applied Manufacturing Technology
7.	Prof. M.K. Adeyeri	Professor	B.Eng. (Ilorin), M.Eng. (Ilorin), Ph.D. (Akure), MNSE, MMSN, MNIEM, COREN Rgd.	mkadeyeri@futa.edu.ng	Computer Aided Design (CAD/CAM), Computer Aided Manufacturing, Maintenance, Modeling, Agent system Computer Integrated Manufacturing Control and Automation
8.	Prof. T.E. Abioye	Professor	B.Eng. (Akure), MSc.(Nottingham), Ph.D. (Nottingham), COREN Rgd.	teabioye@futa.edu.ng	Manufacturing Engineering, Engineering Management, Lean Manufacturing, Materials Science and Processing, Advance Manufacturing Techniques and Optimization.
9.	Dr. O.O. Ojo	Reader	B.Eng., M.Eng. (Akure), P.hD (Turkey), COREN Rgd.	ooojo@futa.edu.ng	Manufacturing and Materials Processing, Welding Engineering Technologies, Weld Metallurgy, Additive Manufacturing
10.	Dr. E. O. Olutomilola	Senior Lecturer	B.Eng. (Ado), M.Eng.(Akure), PhD (Akure), COREN Rgd.	eoolutomilola@futa.edu.ng	Machine Design, Applied Manufacturing/Production Engineering, Automation, and Control, Food Processing.
11.	Dr. O.T. Ojo	Senior Lecturer	B.Eng. (Ado), M.Eng.(Akure), PhD (Akure), COREN Rgd.	otojo@futa.edu.ng	Engineering Systems Design/Development, Advanced Manufacturing, Composite Materials, Materials Characterization .

9.7.4 DEPARTMENT OF MECHANICAL ENGINEERING (MEE)

1. PROGRAMMES OFFERED

a) PGD - Mechanical Engineering
b) M. Eng - Mechanical Engineering
c) Ph.D - Mechanical Engineering

2. AVAILABLE OPTIONS

a) M. Eng with specialization in Building Services Engineering and Production Engineering.
b) Ph.D with specialization in Building Services Engineering Production Engineering.

3. PHILOSOPHY AND OBJECTIVES

(a) PGD - Mechanical Engineering

(i) Philosophy

Under this programme, the students are trained for the award of Post-Graduate Diploma (PGD) in Mechanical Engineering. The programme is designed for those who wish to bridge their academic career from the practical oriented course (Higher National Diploma) to a more theoretical course (Post-Graduate Diploma) in Engineering or those who wish to improve their academic career from the practical oriented to the more theoretical, research - based. studies in the University, and subsequently pursue higher degree course. Students are made to take some compulsory courses that will further prepare them for Management status in Industries. The programme is designed to enable both fresh graduates and practicing Engineers to acquire more theoretical and practical knowledge in engineering through taught courses and research works.

(ii) Objectives

The objectives of this programme are to:

- bridge the gap between the practical and theoretical knowledge
- enable the candidates with HND to further their academic career

(b) M. ENG - Mechanical Engineering

(i) Philosophy

Under this programme, the students are trained for the award of M.Eng degree in Mechanical Engineering. Students in both options are made to take some compulsory courses, which are designed to prepare them for both independent research work for further studies and management status in Industries. The programme is designed to enable both fresh graduates and practicing Engineers to acquire advanced and latest techniques in engineering through taught courses and research works.

(ii) Objectives

The objectives of the programme are to:

- expose students to advance engineering techniques
- develop in the students a sound knowledge of Mechanical Engineering
- prepare students for further studies and managerial position in industries

(c) Ph.D - Mechanical Engineering

(i) Philosophy

Under this programme, the students are trained for the award of Ph.D in both available options. Students are made to undergo research works for a minimum of three or five years depends on whether the student is on full- time or part-time respectively. The programme was designed, so that the student will be able to face academic and social challenges in the nearest future

(ii) Objectives: The objectives of this programme are to:

- expose students to advance research techniques in Engineering
- develop in the students advanced knowledge of Mechanical Engineering
- prepare students for independent research activities and managerial position.

5. ADMISSION REQUIREMENTS

(a) PGD - Mechanical Engineering

A candidate for PGD degree programme must in addition to the general University admission requirements hold one of the following qualifications:

i. A first degree with at least 3rd Class grade in Mechanical Engineering and other related disciplines from the Federal University of Technology, Akure or other recognized Universities.
ii. HND with a minimum grade of Lower Credit in Mechanical Engineering or their related disciplines from a recognized Polytechnic or University.
iii. Any other qualification approved by the University Senate.

(b) M.ENG - Mechanical Engineering

A candidate for M. Eng degree programme must in addition to the general University admission requirements hold one of the following qualifications.

i. A relevant first degree with grade not less than Second Class (lower) division from the Federal University of Technology, Akure or from a recognized University in Mechanical Engineering or any other relevant disciplines.
ii. Postgraduate diploma in Mechanical Engineering from the Federal University of Technology, Akure or a recognized University with a Cumulative grade point average of not less than 3.50 of 5.0 grade point average.

(c) Ph.D - Mechanical Engineering

A candidate for Ph.D degree programme of the department must hold, in addition to the general University admission

requirements, a good Master Ddegree in Mechanical Engineering with a cumulative grade point average of not less than 3.50/5.0; from the Federal University of Technology, Akure. Equivalent degree in Mechanical Engineering or relevant field of studies from any other recognized University is also acceptable.

6. DURATION OF THE PROGRAMME

(a) PGD - Mechanical Engineering

Candidate shall be required to spend a minimum of four (4) semesters. Senate may approve an extension on exceptional cases.

(b) M. ENG - Mechanical Engineering

The required duration of the programme shall normally be required to spend between 18 and 24 Months on full time. Senate may approve an extension on exceptional cases.

(c) Ph.D - Mechanical Engineering

The required duration for the programme is as follows:

i. Full time candidates shall normally be required to spend between 36 and 48 Months. Senate may approve an extension if required.

ii. Part-time candidates shall normally be required to spend between 48 and 60 Months. Senate may be pleased to approve an extension if required

7. REQUIREMENTS FOR GRADUATION

(a) PGD - Mechanical Engineering

Candidate must complete a minimum of 63 units comprising 57 units of course work and 6 units of independent research work.

(b) M. ENG - Mechanical Engineering

To be eligible for M.Eng. degree of the Department, candidate must satisfactorily complete a minimum of 45 units; made up of 33 units of course work and 12 units of research work.

(c) Ph.D - Mechanical Engineering

The requirements for graduation shall be stated as follows: The candidate shall carry out a research work as approved by the appropriate organ of the University. In addition, if the candidate's transcript is deficient of some core courses at the Master degree level, the candidate shall take those courses as approved by the department.

8. COURSE OUTLINE

(a) PGD - Mechanical Engineering

FIRST YEAR FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 700	Seminar	0	0	3	1
MEE 711	Engineering in Society	2	0	0	2
MEE 713	Engineering Mathematics (I)	2	1	0	3
MEE 715	Engineering Materials	1	0	3	2
MEE 717	Engineering Thermodynamics	2	0	3	3
MEE 719	Engineering Graphics	2	0	3	3
	Total				**14**

SECOND SEMESTER

Course Code	Course Title		L	T	P	Units
MEE 722	Computer Prog. & Numerical Methods	2	0	0	2	
MEE 724	Engineering Mathematics II	2	0	0	2	
MEE 726	Technical Report Writing	2	0	0	2	
MEE 728	Statistical Methods		2	0	0	2
MEE 720	Strength of Materials		2	0	3	3
MEE 722	Fluid Mechanics		2	0	3	3
	Total					**14**

SECOND YEAR
FIRST SEMESTER

Course Code	Course Title		L	T	P	Units
MEE 739	Engineering Law, Management & Enterp	3	0	0	3	
MEE 731	Mechanics of Machines		2	0	3	3
MEE 733	Engineering Design I		2	0	3	3
MEE 735	Mechanical Vibration		3	0	0	3
MEE 737	Heat and Mass Transfer	3	0		0	3
	Total					**15**

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 742	Engineering Design II	2	0	3	3
MEE 744	Automatic Control Systems	3	0	0	3
MEE 746	Engineering Maintenance	1	0	6	3
	Elective I	3	0	0	3
	Elective II	3	0	0	3
	Total				**15**
MEE 799	PGD Research Project	0	0	18	6
	Total				**6**

Electives

Course Code	Course Title	L	T	P	Units
MEE 750	Manufacturing Process/Introduction to CAM, Tools and Jig Design	2	0	3	3
MEE 752	Internal Combustion Engines	2	0	3	3
MEE 754	Metrology (Measurement & Instrumentation)	2	0	3	3
MEE756	Energy Studies	3	0	0	3
MEE 758	Air Conditioning & Refrigeration	3	0	0	3
MEE 760	Foundry Technology	3	0	0	3
MEE 762	Engineering Metallurgical	3	0	0	3

(b) M.ENG - Mechanical Engineering

(i) Common Courses

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 809	Design & Analysis of Industrial Experiments	2	1	0	3
MEE 817	Advance Engineering Mathematics	2	1	0	3
	Total				**6**

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 810	Applied Metrology	1	1	3	3
MEE 814	CAD/CAM for Manufacturing	1	1	3	3
MEE 816	Project Management	2	0	3	3
MEE 818	Computer Programme	1	1	3	3
	Total				**6**

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 899	Master's Thesis Research Project	0	0	0	12
	Total				**12**

(ii) Building Services

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 801	Thermofluids	2	1	0	3
MEE 803	Heat and Mass Transfer	1	1	3	3
MEE 805	Noise and Vibration	1	2	0	2
	Total				**8**

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 802	Air Conditioning System	2	1	0	3
MEE 804	Refrigeration Processes	2	1	0	3
MEE 806	Mechanical & Electrical Installation on Building	1	1	3	3
	Total				**9**

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 899	Master's Thesis Research Project	0	0	0	12
	Total				**12**

(iii) Production Engineering Option

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 807	Advanced Technique of Linear Optimization	2	1	0	3
MEE 811	Design for Production	1	1	3	3
MEE 813	Applied Manufacturing Engineering Methods	2	0	3	3
	Total				**9**

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MEE 808	Advanced Technique of Non-Linear Optimization	2	1	0	3
MEE 812	Design and Manufacturing of Machine Tools	2	0	3	3
MEE 820	Applied Techniques of Production Management	2	0	0	2
	Total				**8**

(c) Ph.D - Mechanical Engineering

Course Code	Course Title	L	T	P	Units
MEE 999	Doctoral Research Project	0	0	0	12

9. COURSES SYNOPSES

(a) PGD - Mechanical Engineering

MEE 711: Engineers in Society (2 units)
Definitions of Engineer in Society, Growth and effect of Technology on society, Industrial revolution, Modern development - power, transportation, communication etc. Professional bodies and Engineering Societies, Ethics, Cannons, Codes, Standards of Engineering Societies, The Roles and responsibilities of engineering personnel in Technological development and nation building. Education and Training of Engineering Personnel.

MEE 713: Engineering Mathematics I (2, 1, -) 3
Matrices. Vector Analysis. Partial Differential Equations. Complex Variables., Numerical Analysis. Special Functions and Integral. Probability and Sampling, linear Programming.

MEE 715: ENGINEERING MATERIALS AND APPLICATION (1, -, 3) 2
National and international standards for the classification of engineering materials, classes of materials; High temperature materials, packaging materials, high strength materials, optical and magnetic materials, automotive materials, tools, steels, stainless steels, ceramics, polymers, cement, petrochemicals materials. Mechanism of deformation and fracture at elevated temperatures. Creep and fatigue theories. Yield criteria. Strengthening mechanisms of super alloys and refractory materials. Environmental effects on materials. 30h(T), 45h(P).

MEE 717: THERMODYNAMICS.(2, -, 3) 3. Review of Engineering fundamentals of thermodynamics (including laws, processes and cycles) selected issues: closed and open systems, energy degrading. Thermodynamics control, surface and volume analysis. Vapour and gas powe cycles. Internal combination engines. Properties of mixtures. Advanced treatment of fundamental combustion process. Mechanis of heat transfer and Heat exchange designs. Vapour compression and absorption refrigeration systems. Applicaation of thermodynamic theory ad design principles for comfort and cooling, food refrigeration and cryogenic systems. Properties of refrigerant, refrigeration. Control systems. Gas dynamics; Internal flow(pipes, noozzles, etc), External flow(Aircraft, projectiles, etc), Waves(elastic, shock). Available and unavailable energy of systems.

MEE 719: Engineering Graphics (2,-,3) 3
Review of rotation of surfaces in various planes, Intersections programming. Assembly drawing.
Introduction to Computer Aided Drafting.

MEE 720: Strength of Materials (2,-,3) 3
Thick Shells: Determination of stresses and strains in single and compound cylinders under internal and external pressures. Stresses in axially thin, long and variable thickness rotating discs. Columns and struts: Theoretical analysis for short and long columns (e.g. the Euler formular, J.B. Johnson formula, cook column formula etc). Derive and explain buckling heads of columns for pin jointed built-in ends combinations' of both. State the limitations of the. theory and apply empirical equations to determine the buckling loads. Bending of beans and circular plates: Determination of stresses in bars of large and small curvatures and combined bending and direct stress. Shear centres of unsymmetrical beams. Formulation of plastic hinge, collapse loads, simply supported and fixed beams. Stresses and deflections in bending of thin circular plates with small deflections. Plastic theory of bending. Torsion of Shafts: Combined bending and torsion in shafts. Stresses in non-circular shafts. Wrapping function in the torsion of non-circular shafts. Riveted and bolted connections: Types of riveted joints and their classifications. Determination of strength of rivet and plate. Strength and efficiency of joints. Stresses due to eccentric loading of joints and joints under torsional loading. Mode of failure of joints. Elasticity theory: Stresses - strain relations. Two dimensional stress and strain. Analysis of stresses in three dimensions using Mohr's circle. Experimental stress analysis: Model analysis. Scale factors and materials. Principles of electrical strain gauge for strain measurement. Basic introduction to photo elasticity -birefringence, soclinics, isochromatics, stress optic law.

MEE 722: Computer Programming (1, -, 3) 2 Programming Technique - flow charting and building of algorithms, Review of numerical methods, Software; machine -,language, Computer language e.g. BASIC, COBOL, ALGOL, FORTRAN, VISUAL BASIC, C++, FORTRAN statements

- Arithmetic Control - Inputs / output - FORMAT - Do Statement programme for simple problems. Subscripted variables and Matrix operations. Writing subroutines and sub - programmes. Computer packages (Windows, Excel, AUTOCAD etc).

MEE 724: Engineering Mathematics 11(2,1, -) 3
Revision: Polynomials, Roots of Equations, Remainder . Theorem, Curve Sketching and Curve Fittings. Matrices: Equations and Application to real life problems. Vector Analysis: General Knowledge and Application to Two- and Three - Dimensional problems (Motion Study). Partial Differential Equations: Including Application to limits of power series. Complex Variables: including Linear, quadratic and Complex Transformations from real to imaginary planes.

MEE 726: Technical Report Writing (2,-,-) 2
Introduction to the principles of effective communications with attention to the importance of emphasis, emotion contact and style. Principles of technical writhing Organisation and preparation of technical report (including proper referencing). Technical correspondence. Date assisting and deduction in presentation. Oral presentation of technical reports. Technical aid in presentation.

MEE 728: Statistical Methods (2, -, -) 2
Descriptive Statistics: Central tendencies and dispersion. Elementary probability theory conditional probability Baye's theorem, probability distributions and applications. Elementary theories of sampling and estimation. Test of hypothesis and significance. Survey fitting, Linear and Multiple regression analysis; Linea correlation. Analysis of variance, Time series analysis. Statistical quality control for mean, standard deviation range number of defects etc., sampling techniques average sampling number stochastic processes.

MEE 731:Mechanics of Machines (2, - ,3) 3 Units
Dynamics of Rigid Body: Analyses of inertia forces and torques. Advance: Kinematics of mechanisms. Two dimensional rigid body problems. Governors and Operation Principles Construction and operations of different engine governors. Calculation of forces and ranges of speeds 01 governors. Balancing of rotating masses: Analyses of the balancing of rotating masses in the same and in different planes. Determination of primary and secondary balancing forces and moments of reciprocating
machines, compressors. Effects of balance on the performance characteristics of vehicles and other machines. Cam Valves and their applications: Principles of operation of various cams; analyses of off-set roller and tangent cam with roller followers: Calculations on cams (e.g. displacement of followers, velocity, angles, etc.). Gyroscope and itsapplications: Analyses of forces and moments acting ona gyroscope. Determination of the gyroscope couple. And acceleration for a plane disc. Effects of gyroscopic couple on the whirling of shafts. Applications of gyroscope in automobile, ships, aero planes and locomotives.

MEE 732: Fluid Mechanics (2,-,3) 3
Kinematics and dynamics of fluid motion. Applications to fluid machinery, flidics , propulsion system, Elementary hydrodynamics. Properties of real fluid, incompressible and compressible fluid, ideal, viscous and compressible fluids under internal and external flow conditions. Inviscid flows, boundary layer, normal and shock wave and flow machines.

MEE 733: Mechanical Engineering Design I(2,-,3)3
Failure theories combine loading: Fatigue and fatigue design. Shaft design. Power transmission: Gear, belt, rope, and chain drives, Types of joints. Analysis, synthesis and evaluation procedure in creative design. Use of codes, standards, charts, tables and empirical data. Thick and thin walled pressure vessels. Rotating cylinders. Creative group design project.

MEE 735: Mechanical Vibration (3,-,-) 3
Free and forced vibration of lumped mass - spring systems with and without damping in single, double and multi-degrees of - freedom. Response to harmonic periodic, and non-periodic excitations. Matrix methods and Eigen value problems, natural frequencies, modes of vibration and resonance. Transverse vibration, whirling of shafts and torsional. .vibration. Vibration
Isolation.

MEE 737: Heat And Mass Transfer (3,-,-) 3
Steady states condition: review of fundamentals; application to engineering services. Convective heat transfer: Forced convection heat transfer in Laminar and turbulent flow; thermal boundary layer; flat plate heat transfer. Design aspects of heat exchangers: Basic types; design and selections; fundamentals of mass transfer; molecular mass transfer; diffusion coefficient; convective mass transfer. Steady state molecular diffusion: One-dimensional mass transfer: diffusion - a through a stagnant layer.

MEE 739: Engineering Law Management and Entrepreneurship (3,-,-) 3
Management concepts making organizational structure. Motivation, Leadership styles and functions. Bureaucracy. Authority, informal organization. Organizing and controlling. Departmentalization and coordination. Controlling, collective bargaining. Work and motion study, critical path method (CPM). Inventory control. Assembly line balancing and line of balance analysis scheduling. Nigerian legal system as it affects engineering: Industrial safety laws; Industrial law and labour relations; Law of contracts and tort; Agency law; Patent law; Principles and types of business ownership, including advantages and disadvantages of each; Steps in setting up a partnership.

MEE 742: Mechanical Engineering Design II(2,- ,3)3
Thermal stresses in cylinders. Bucking theory for cylinder, design for external pressure. Pipe flexibility analysis. Smooth and mitred pipe bends. Ranged design, .plastic analysis of shell structures - yield surfaces and applications to circular plates and cylinders. Design of pressure vessel ends - flat and dished ends. Design of branch reinforcement, particularly nozzles in spheres. Introduction to CAD/CAM. 30h(T); 45h(P).

MEE 744: Automatic Control System (3,-,-) 3
Mathematical Modeling of Dynamic System: Dynamic equations of mechanical (translational and rotational), electrical, electromechanical, hydraulic, thermal and pneumatic systems). Transfer function of control system components: Transfer function of mechanical devices (simple lever, compound lever, differential lever gyroscope, gears); electrical .and electronic circuits. (field-controlled and armature - controlled d.c. motor servo-motor, operational amplifier circuits), pneumatic components (bellows flapper - valve, relay, actuator): hydraulic components (valve, -linear actuator). Block diagram and linear graphs. Time-response analysis: Standard test signals (step, ramp or impulse signals) time response of first-order and second order systems: Steady-state errors and error constants. Frequency - response analysis: Nyquist and Bode plots - by sketching and use of experimental data. M - and N - Circles. (closed - loop frequency response). Analysis of system stability: Concept of system stability. Routh - - Hurwitz criterion and applications Nyquist stability criteria. Gain margin and phase margin. Relative stability using Nyquist criterion. Root locus method: The root locus concept. Construction of roof loci. Interpretation of the root locus diagram. Introduction to systematic control design (system compensation): Need for system compensation. Preliminary design considerations. Series and parallel (feedback) compensation. Compensation using lead, lag and lead- lag devices and their practical realization in mechanical, pneumatic and hydraulic systems. Effect of proportional (p), Integral (I) and Derivative (D) control actions on system performance. System compensation using the root - locus of Bode Approach. Analogue Computer Simulation: Need for computer simulation. Analogue computing elements. Analogue computer simulation of control systems. Computer operating modes. Amplitude and time sealing. (30h('I'), 45h(P).

MEE 746:Mechanical Engineering Maintenance (1,- ,6) 3
Importance of maintenance organization: Factors of maintenance (primary &secondary). Types of maintenance: breakdown, preventive, predictive etc. strategies for effective maintenance. Maintenance of industrial mechanical equipment (practical maintenance); types (preventive, repair or corrective, project improvement). Mechanical maintenance of generators: fuel injection systems, engine starting procedures, causes of engine failures (faults/remedies). Machine tools maintenance definition, maintenance characteristics, advantages of maintenance (economic, technical, organizational and human), maintenance. Systems (schedule and procedures, lubrication, cleanliness, fault indications-vibrations, chatter, overheating and intermittent operation of equipment). Mechanical maintenance of - compressors; types, maintenance (mounting and alignment - foundation, anchor bolts, alignment, and misalignment), belt driven installation. Maintenance of mechanical drives friction and mesh drives (types and maintenance). Hydraulic and pneumatic system maintenance: definitions and types of maintenance. Types and properties of hydraulic fluids. 30h(T); 45h(P)

MEE 750: Computer Aided Design and Manufacturer (1, -, 3) 3
Introduction to computer aided design. Information generation, retrieval, analysis and use. Simulation: Modeling, verification and validation. Digital simulation . languages, features and comparison. Simulation and performance of controllers tools path simulation. Database: Interface with manufacturing, drafting. Povers control, inspection, technical illustration and other units. Graphic: graphic software, instruction. Display file: Transformations, windowing, perspective, hidden lines removal etc. Design packages. Documentation and manufacturing assistance from design database, drawing and flowchart. Installing a . CAD system. CAD hardware: workstation, seats, mouse and tablets, plotter, printer.

MEE 752:Internal Combustion Engines (2,-,3) 3
Review of basic thermodynamic principles. Hydrocarbon fuels, structures properties and test
methods, alternative fuels for internal combustion engines. Combustion: Stoichiometry, effects of dissociation, residual; fraction, etc. fuel-air cycle analysis using combustion charts/ piston engine combustion phenomena, pre-ignition, detonation and knock Exhaust gas emissions, formation characteristics, effect, methods of measurement and reduction. Legal requirements. fluid mechanics of internal of internal combustion engines, fuel metering, injection and exhaust systems. Alternative engines: Gasturbine, wankel, sterling, electric etc. characteristics method of measurement and reduction. Design of engine components. Tube charging, Engine Tests.

MEE 754: Measurement and Instrumentation (Metrology) (3,-,-) 3
General Principles of instrumentation and measurement precision and accuracy measurement of lengths rays; block gauges, comparison with know lengths, graduate scales rotation of screwed shaft, angular measurement - combination angle gauge sine base author collimator angle decor, precision level: Determination. of straightness of surface. Measurement of form optical measurement of screw threads: major / minor diameter, simple effective diameter, thread pitch, thread form, virtual.

MEE 756:Energy Studies (3,-,-) 3
Analysis of energy demand in society. Types, grades, and applications, sources and resourced. Energy conservation, Conversion, combustion, Nuclear fission and fusion. Hydro - energy alternative sources of energy. Solar, geothermal, wind and tides power generation. Economic, environmental, political and social considerations. 30h{T); 45h(P)

MEE 758: Refrigeration, Air Conditioning and Other Building Services (3,-,-) 3
Review of psychometrics. Air conditioning equipment/ components, boilers and chillers, cool towers, heat pumps - characteristics, design and selection techniques. Cryogenics, types and application of pipes. Pipe fitting. Ughting - sources, characteristics, design and applications. Heat gain from solar and other sources. Factors influencing solar gains. Air conditioning load due to solar gain through glass, infiltration, heat gains through lighting, occupants, and other appliances. Firefighting systems, equipment's code and regulation. Environmental pollution. Vertical transportation system.

MEE 760: Foundry Technology (3,-,-) 3
Pattern making technology; Materials, and tools for pattern making; Mould and core making technology: Sands used moulding: Moulding processes; machine moulding; Core sands and core making; Casting procedure; Casting methods; Gating systems; Casting design; Melting furnaces Refractories for melting unit; Metallurgical characteristics of cast metals;Pollution control in foundries.

MEE 762: Engineering Metallurgy (3,-,-) 3
Crystal structures of metals and alloys: binary and ternary phase diagrams. Characteristics of alloy micro- structure. Nucleation and growth, solidification. Metallurgical microscopes, and techniques for microscopic observation. Alloys· and alloy steels. Classification and grading of alloy steels. Normalizing, annealing, hardening and tempering treatment for steel, surface hardening, precipitations hardening of steels. Austempering and martempering of steel. Heat treatment for copper and aluminium alloys. Corrosion and oxidation phenomenon mechanical working of metals. 30h(T) 45h (P).

MEE 799. PGD Research Project (-, ., 18) 6
Industrially oriented research project relevant to individual candidates area of specialization.

(b) **M. ENG - Mechanical Engineering**
MEE 801: Thermofluids (3 Units)
Mathematical development of the 1st and 2nd laws and their applications to the formulation of thermodynamic properties; thermodynamics of binary mixtures and equilibrium of phases; fugacity and entropy changes at constant temperature; gas liquid-fraction. Fluid flow Fans and pumps and their characteristics; pressure drop in pipes and ducts; design methods for air and water distribution system; steady and pulsating compressible flow.

MEE 802: Air Conditioning Systems (3 Units)
Physiological and comfort conditions for air conditioning: Types of systems and their suitability for a various applications. Design of Air-conditioning Systems. Insulating Materials. Psychometric Duct and pipe design. Air-Conditioning Equipment. Ventilation and Filtration. Case Studies - this involves load estimating, duct pipe sizing and equipment selection with detailed installation diagrams.

MEE 803: Heat and' Mass Transfer (3 Units)
Solution of the heat diffusion equation by analytical and numerical methods. Convection, boiling and condensation. Radiation. Mass transfer by diffusion and convection. Analogies with momentum and heat transfer.

MEE 804: Refrigeration Processes (3 Units) Advance treatment of the vapour compression cycle Complex. cycles and cascade systems. Absorption refrigeration systems and their analysis. Cooling load estimation in refrigeration applications. Refrigerants - Properties miscibility, lead detection, development of fluorocarbons and specific uses. Alternative refrigerants, CFC and ozone depletion. Applications and Case Studies - Economic considerations, water chillers, storage design, food freezing. Ice making, dairy, ice cream. Refrigeration in transportation, computer applications to analysis and design of refrigeration and air-conditioning system.

MEE 805: Noise and Vibration (2 Units)
Sources of noise and its measurement. Sound pressure and sound power. Noise criteria (N.C) curves. Noise propagation. Noise measurement. Occupational problems of Noise. Attenuation of noise. Importance of vibration. Classification. Analysis procedure. Free vibration of single' degree of freedom systems, Harmonically excited vibration. Vibration under general forcing conditions. Two degrees of freedom system, Determination of Natural frequencies and mode spaces. Vibration control. Vibration measurements.

MEE 806: Mechanical and Electrical Installations in Buildings (3 Units)
Plumbing design for water systems, fire hydrants and gas installations. Case studies of plumbing design for large and small buildings. Lifts. Types: Equipment (including machine room equipment): sound installation design factors and selection criteria: lifts specifications electrical Installation - Review of fundamental laws of electrical induction and application to household and industrial needs: Principles of electricity generation; Energy resources: Renewable and non-renewable energy resources; Different types of turbine for electricity generation, Basic principles of transmission and distribution; the high tension overhead lines the step-up power transformers and local center: the transformer principle: the Nigerian grid; supply to presidential houses and large estates. Electrical Supply. Circuits - Power supply to buildings and equipment. Lighting wiring design and types of wiring systems. The Nigerian wiring regulations and lEE wiring regulations. Safety Precautions.

MEE 807: Advanced Techniques of Linear Optimization (3 Units)
Linear Programming, Integer Programming. Network Analysis. Dynamic Programming. Network Analysis. Dynamic Programming. Game theory.

MEE 808: Advanced Techniques of Non-linear Optimization (3 Units)
Probability theory: Queuing theory: Inventory Models Mar4kovian decision processes and applications. Reliability. Decision analysis. Quadratic programming. Convex programming. Simulation.

MEE 809: Design and Analysis of industrial Experiments Planning of Experiments (3 Units). Basic statistical methods, the normal distribution. Principles of experimental designs. The analysis of data from orthogonal designs, functional experiments, response surface and mixture designs, analysis of covariance; balanced in complete block and general non-orthogonal block design ransom effect models: variance components and sampling schemes.

MEE 810: Applied Metrology (3 Units)
Basic considerations' of measurement. Slip gauges. Tolerance and Limit system. Screw thread tolerance. Gauge tolerances. Measurement of straightness, flatness, roundness, profile measurement, measuring machine and comparators. Internal measurement. Screw threads and gear measurement techniques. Surface texture assessment and instruments. Inspection and gauging. Quality control. First and second order systems. Transducers. Force and Torque measurement. Application of laser in metrology.

MEE 811: Design For Productions (3 Units)
Design element of basic manufacturing processes such as weld-meats, casting including pattern making. Design of shafts and other power transmission elements for assembly. Design for batch production and flow-line production. Standards and preferred numbers. Hydraulic and pneumatics element. NU/ CNC concepts in design. Design concepts in non-cutting processes.
Design of templates jigs and fixtures.. Design of bodies and frames. Design of cutting tools and process tools. Economics and ergonomics of design and manufacture.

MEE 812: Design and Manufacture of Machine Tools (3 Units)
Design principles of lathes, milling machines and drilling machines. Manufacture of transmission elements bodies and frames in machine' tools, Hydraulic: Pneumatic and electrical transmissions. Installation and testing of machine tools. Machine tool; maintenance. Jigs and fixtures in machine tools. NCCNC control.

MEE 813: Applied Manufacturing Engineering Methods (3 Units)
Metallurgical properties of engineering materials. Basic machining techniques. Sheet metal work. Metal forming processes such as forging, rolling sheet and wire drawing etc. Finishing processes. Welding technology. Foundry technology. Polymer processing.

MEE 814: CAD/CAM for Manufacturing (3 Units)
Application of CAD/CAM to plant layout. Computer integrated manufacturing and solids modeling. CAD/CAM workstations. Use of finite element analysis, geometric modeling and physical simulation to study the state and dynamic characteristics of products to be manufactured.. Interface and function of the CAD/CAM system to the shop floor.

MEE. 820: Applied Techniques of Production Management (2 Units)
Design of production system. Plant layout, materials handling. Production planning and Control. Works study. Resource allocation methods. Market analysis. Maintenance management. Quality assurance.

MEE 816: Project Management (3 Units)
Project feasibility analysis, Project Planning. Scheduling and Control using network methods. Project costing. Cost duration analysis. Limited resource scheduling. The resource balancing problem. Project reporting.

MEE 817: Advance Engineering Mathematics (3)
Complex numbers and hyperbolic function. Matrices and vector spaces to include eigenvalues and eigenvectors, Raleigh - Ritz method of solution of mechanical vibrations. Fourier's - Drrichlet conditions Fourier co-efficient. Discontinuous functions integration and differentiation. Complex Fourier series: Higher order ordinary differential equations. Partial differential equations general and particular solutions, separation of variables and other methods. Complex variables. Numerical methods. Finite element method.

MEE 818: Computer Programming (3 Units)
Fortran Language Fundamental computer sciences. File processing. Data .structures and algorithms. Operating system. Programming using C+ + and Visual basic. Basic computer architecture. Software engineering. Computer installation. Introduction to computer networks.

MEE 899: Master' Thesis Research Project (12 units)
Research projects that are industrially oriented and must be relevant to individual area of specialization.

(c) **Ph.D· Mechanical Engineering.**
Not applicable .

LIST OF ACADEMIC STAFF IN THE DEPARTMENT OF MECHANICAL ENGINEERING (MEE)

S/N	NAME	STATUS	AREA OF SPECIALISATION	E-MAIL	PHONE NUMBER
1	Prof. S. A. Anjorin	Professor	Energy Systems/ Building Services	saanjoring@futa.edu.ng	08065177910
2	Prof. M. A. Akintunde	Professor	Energy Systems Design, Thermo-fluids, Building services Design Engineering	maakintunde@futa.edu.ng	08035011797
3	Prof. T. I. Mohammed	Professor	Design of production, Textiles and Equipment, Environment Ecology	timohammed@futa.edu.nd	08132762022
4	Prof. O. A. Dahunsi	Professor	Mechatronics, System Design, Intelligent Control Systems, vibration Mechanics and Control, Manufacturing and Condition Monitoring	oadahunsi@futa.edu.ng	08162539990
5	Prof. T. I. Ogedengbe	Professor	Design Manufacturing & Automation	tiogedengbe@futa.edu.ng	08038073724
6	Prof. C. O. Ijagbemi	Professor	Energy and Environment	coijagbemi@futa.edu.ng	08131814090
7	Prof. A. O Akinola	Professor	Thermo-fluids, Applied Energy Systems, Building Services Engineering, Welding Engineering	aoakinola@futa.edu.ng	08033897286
8	Prof. I. F. Titiladunayo	Professor	Renewable/ Non-Renewable Energy Systems Design, Thermal systems Design, Biomass/Bioenergy, Building Services Engineering, Thermo-fluids, Energy Auditing	iftitiladunayo@futa.edu.ng	08037447426
9	Prof. T. S. Mogaji	Professor	Energy Systems, Renewable Energy, Storage Cooling/System Design, Numerical Design of Thermal Systems Enhancement	tsmogaji@futa.edu.ng	08143181937
10	DR. R. K. Apalowo	Senior Lecturer	Structural and Fluid dynamics and Fracture Mechanics	rkapalowo@futa.edu.ng	
11	Dr. O.M. Olabanji	Senior Lecturer	Sustainable Design Decision making	omolabanji@futa.edu.ng	08038552639
12	Dr..O. Z. Ayodeji	Senior Lecturer	Thermo-fluid/Engineering Design	ozayodeji@futa.edu.ng	08109931504

9.7.5 DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING (MME)

1. PROGRAMMES OFFERED

a) Postgraduate Diploma (PGD)
b) Master of Engineering (M. Eng)
c) Doctor of Philosophy (Ph. D)

2. AVAILABLE OPTIONS/ SPECIALIZATION

a) PGD (Metallurgical and Materials Engineering)

b) M. Eng with specialization in

i. Minerals Engineering (Mineral Processing Technology/Extraction Metallurgy)
ii. Production / Mechanical Metallurgy
iii. Physical Metallurgy/ Corrosion Engineering
iv. Advanced Materials Engineering

c) Ph. D with specialization in

i. Minerals Engineering (Mineral Processing Technology/Extraction Metallurgy)
ii. Production Metallurgy
iii. Mechanical Behaviour of Materials
iv. Physical Metallurgy /Corrosion Engineering
v. Advanced Materials Engineering.

3. PHILOSOPHY AND OBJECTIVES

(a) PGD and M.Eng:

In order to have an in-depth knowledge of the basic principles underlying the body of knowledge in Metallurgical and Materials Engineering, candidates are trained to develop broad analytical mind that would enhance major intellectual and technological breakthrough and also to provide each student the opportunity to develop his special area of interest. This is to enable each student to learn the fundamental concepts of special fields in Metallurgical and Materials Engineering that will enable them to achieve the highest degree of professional competence. Furthermore, the M.Eng degree is offered such that the students are adequately versed in their disciplines and are taught advanced courses with emphasis on developing sound theoretical and applied knowledge relevant to the Mineral, Metallurgical and Engineering Materials Industries.

(b) Ph D

Ph.D candidates are trained to develop broad analytical mind that would enhance major intellectual and technological breakthroughs to improve production in Mineral, Metallurgical and Engineering Materials Industries. Furthermore, the Ph.D. degree is offered such that the students are adequately versed in their disciplines and be competent in imparting the knowledge to others in a conducive academic environment to ensure the continued existence of the system.

4. ADMISSION REQIREMENTS

(a) PGD

Prospective candidates for the programme must possess any of the following academic qualifications:

i. Higher National Diploma in Metallurgical and Materials Engineering with minimum grade of lower credit from recognized institutions of higher learning.
ii. Bachelor of Science Degree in relevant applied Physical Sciences with a minimum of Third Class Honours/Second Class Lower Division from a recognized University. They would require taking basic engineering sciences at the undergraduate level (This include Engineering drawing, strength of materials, applied mechanics and machine design, and engineering thermodynamics).
iii. B. Eng. or B.Sc. Degree (3rd class) in Metallurgical and Materials Engineering from a recognized University.

(b) M.Eng

Candidates with a Bachelor Degree in Metallurgical and Materials Engineering and related fields with a minimum of second class lower from this or any other recognized university are eligible to apply for admission into the programme.

Holders of Postgraduate Diploma in Metallurgical and Materials Engineering with at least Upper Credit pass may be considered.

Previous industrial experience and professional qualifications will be an added advantage.

(c) PhD

The admission requirements include:

M. Eng. or M. Sc in Metallurgical and Materials Engineering with a minimum score of 60%.

6. DURATION OF PROGRAMME

a) PGD

The programme is for a minimum of four (4) semesters of course work and project.

b) M. Eng

The duration is 18 to 24 months for the full time M. Eng programme, including course work and project.

c) Ph. D

The duration is 36 to 48 months for full time PhD candidates, while that of part-time programme is 48 - 72months.

7. REQUIREMENTS FOR GRADUATION

a) PGD

To qualify for the award of Postgraduate Diploma in Metallurgical and Materials, a candidate must have been credited with at least 69 units of compulsory courses, which include the project work.

b) M. Eng

Candidates for the award of M. Eng. Degree in Metallurgical and Materials must satisfy the following requirements:

i. Complete successfully 36 unit courses both first and second semesters which include project work for all areas of specialization.
ii. Conduct a precribed project work and submit the required number of copies of thesis for examination
iii. Present at least two seminars on his or her project (proposal/progress and final) before the viva

iv. Perform satisfactory well during the oral examination (viva) of his thesis;
v. Revise and submit the required number of copies of the thesis after examination as specified.

c) Ph. D

Candidates for the award of Ph.D Degree in any of the options in Metallurgical and Materials Engineering must satisfy the following requirements:

i. Conduct a prescribed research work. Present at least three (3) seminars (proposal, progress and pre-viva) before the viva.
ii. Submit the required numbers of copies of thesis for examination.
iii. Perform satisfactory well during the oral examination (viva) of his thesis.
iv. Revise and submit the required number of copies of the thesis after the examination.

8. COURSE OUTLINE

A. PGD

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MME 701	Structure and Properties of Materials	2	0	3	3
MME 703	Production Metallurgy	3	0	0	3
MME 705	Mineral Processing	2	0	3	3
MME 707	Engineering Drawing	0	0	9	3
MME 711	Engineering Mathematics	2	0	3	3
MME 713	Statistical Method for Engineers	2	0	3	3
	Total				**18**

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MME 704	Engineers in Society	1	0	3	2
MME 706	Extraction & Refining of Materials	1	1	3	3
MME 708	Metallurgical Thermodynamics	2	1	0	3
MME 710	Physical Metallurgy I	3	0	0	3
MME 712	Metallurgical Engineering Laboratory	0	0	6	2
MME 718	Introduction to Engineering Materials	2	0	0	2
MME 724	Numerical Methods & Computer Programming	0	0	9	3
	Total				**18**

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
MME 715	Physical Metallurgical II	3	0	0	3
MME 717	Extraction & Refining of Materials II	2	0	3	3
MME 719	Heat and Mass Transfer	2	1	0	3
MME 721	Metals & Materials Process/Plant Design	2	0	3	3
MME 729	Technical Report Writing	2	0	0	2
MME 731	Law, Management and Entrepreneuship	2	0	3	3
	Total				**17**

FOURTH SEMESTER

Course Code	Course Title	L	T	P	Units
MME 716	Polymer Technology	2	0	0	2
MME 722	Corrosion Engineering	2	0	1	3
MME 726	Fuel, Furnaces & Entrepreneurship	2	0	1	3
MME 799	Project		0	0	18 6
	Total				14

B. M.ENG

FIRST SEMESTER

(Compulsory courses for all area of specialization)

Course Code	Course Title	L	T	P	Units
MME 801	Advanced Process Metallurgy	2	0	3	3
MME 803	Advanced Physical Metallurgy	2	0	3	3
MME 805	Mechanical Behavior of Materials	2	0	3	3
MME 809	Materials Design and Selection	2	0	3	3
	TOTAL				12

SECOND SEMESTER
(Mineral Engineering (Mineral Processing Technology/Extractive Mallurgy)

Course Code	Course Title	L	T	P	Units
MME 812	Fuels, Refractories and Furnace	2	0	3	3
MME 814	Advanced Mineral Processing Technology	3	2	0	3
MME 818	Advanced Ferrous and Non Ferrous Extractive Metallurgy	3	2	0	3
MME 822	Metallurgical Process/ Plant Design and Econs.	3	2	0	3
					12

Physical Metallurgy/Corrosion Engineering

Course Code	Course Title	L	T	P	Units
MME 826	Advanced Forming Processes	2	0	3	3
MME 828	Advanced Welding and Joining Processes	2	0	3	3
MME 830	Advanced Foundry Technology	2	0	3	3
MME 836	Fracture Mechanics and Failure Analysis	2	0	3	3
	TOTAL				**12**

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
	Phase Trasformations & Experimented Techniques	2	0	3	3
	Advanced Heat Treatment Processes	2	0	3	3
	Fracture Mechanics and Failure Analysis	2	0	3	3
	Advanced Corrosion Engineering	2	0	3	3
	Total				**12**

Course Code	Course Title	L	T	P	Units
	Advanced Engineering Materials	3	0	0	3
	Nano-Science and Engineering	3	0	0	3
	Polymer Science and Engineering	2	0	3	3
	Biomaterials	3	0	0	3
	Total				**12**

9. COURSE SYNOPSES

(a) PGD

MME 701:Structure and Properties of Materials 3 Units
Bonding in Solids-metallic, covalent, ionic, Vander walls bonding; Space Lattice and Crystal Systems; Methods of Studying Crystal Structures X-ray Techniques, electron and neutron diffractions; Imperfections in Crystals vacancies, dislocations; Solid Phases, Allotropy or Polymorphism, Gain Boundaries, Types of Solid Phases; Phase Transformation, Crystal Growth. Solid-Solid Transformations. Electrical Properties; resistance Semiconductors, Metallic Conduction. Superconductivity. Thermoelectric Effects; Magnetic Properties, Atomic Magnetic Domains, Magnetically Soft Materials; Permanent (hard) Magnets; Thermal Properties; Nuclear Properties; Elastic Properties of Engineering Alloys; Elastic Stresses in Design, Plastic Deformation; Deformation at Normal Temperature; High Temperature Deformation; Stress Strain Relations in Plastic Deformation; Fracture; Tests Endurance Tests, High-Temperature Strength, Low- temperature Strength, Wear Resistance; Hard Surfaced Metals, Bearing Materials.

MME 703: Production Metallurgy 3 Units
Metal Forming Methods; Modern Processes of Metal Production for Castings; Casting Principles; Various Types of Casting Sand, Die, Shell Mould, Investment, Full Mould, Centrifugal. Relationship between Structure and Properties of Cast Irons; Melting of Cast Irons in Cupola, Induction and Crucible Furnace. Steel Melting for General casting; Acid Furnaces; Deoxidation and Alloying; Non-ferrous Alloys Melting, CuAl.

MME 705: Mineral Processing 3 Units
Structure and Textures of Minerals and their Significance in Mineral Genesis and Minerals Treatment; Application of Mineralogy to Mineral Technology; Ore Dressing; Basic Comminution Processes crushing, grinding; Sizing Analysis and determination of Mineral Liberation Characteristics; Separation Methods-heavy medium separation gravity separation, magnetic separation, electrical separation, froth floatation; Dewatering; Tailing Disposal; Physical and Mechanical Process of Agglomeration.

MME 704: Engineer In The Society 2 Units
Philosophy of science. History of engineering and technology. Safety in engineering and introduction to risk analysis. The role of engineers in nation building. Invited lectures from Professionals.

MME 706: Extraction And Refining Of Materials I (Iron And Steel Making) 3units
Classification and types of iron ores. Agglomeration techniques. Iron making processing routes viz blast furnace, direct reduction and other current processes. Types of fuels and fluxes used in each process routes. The physical chemistry of iron making in each process and their respective controls. Types of mixers. Material and thermal balances. Steel-making processes. Brief description of various steel making process and their technology and advantages. Raw materials requirement and steel making practices. Thermodynamics and kinetics of steel-making viz: refining of hot metal; dynamics and kinetics of steel- making viz. refining of hot meted iron. Brief description of the advantages and drawback of steel-making processes. Secondary steel making processes and manufacture of alloy steels. Argon purging and ladle alloying and desulphurisation. Principles and technology of slab and ingot casting. Types of casting methods top and bottom pouring moulds; horizontal vertical and radial continuous casting machines Casting defects and their control. Merits and demerits or casting techniques.

MME 711: Engineering Mathematics 1 (3 Units)
Review of matrix operation including inversion, Eigen values, Eigen vectors and Canonical transformations and application. Three dimensional vector representations, vector calculus, gradient, divergence and curl line, surface and volume integrals, laplacian operations. Green's Stoke's and Divergence theorems and applications. Ordinary and partial differentia equations, applications and physical problems Complex variables, numerical analysis, special functions and integral, problem formulation, simple method of solution.

MME 707: Engineering Drawing 3 Units
Instruments for engineering drawing and their uses, bisection of lines and angles and their applications. Polygon, tangency, locus of simple mechanism. Factorial drawing; isometric, oblique and perspectives. Orthographic projection. Dimensioning and development of simple shapes. Assembly drawing of simple components. Conventional representation of common engineering features. Freehand sketching.

MME 710:Physical Metallurgy I 3 Units
Phase Diagrams; Solid Solution Systems, Solid-solution Freezing, Uses of Solid Solution diagram, Copper- Nickel: A typical Solid Solution System in other Equilibrium Diagrams; Eutectic Systems, Peritectic System; Non-Equilibrium Solidification, Segregation During Normal Freezing; Zone Melting; Intermediate Phases; Solid State Reactions; Eutectoid reactions; Precipitation from Solid Solution; General Hardening Processes; Precipitation Strain; Solid Solution; Dispersion Hardening; Application of Phase Diagrams; The Iron Carbon System; Irons, Steel Cast Irons; Properties of Iron Carbon Alloys Brasses, Bronzes; Magnesium Alloys; Titanium Alloys; Impurities in Metals.

MME 722: Corrosion Engineering 3 Units
Electrochemical Corrosion; Electrode Potential; Poubaix Diagram; Specific Corrosion Types-uniform; crevice, erosion pitting, galvanic, intergranular, selective leaching, stress corrosion cracking, corrosion fatigue, corrosion control techniques.

MME 708: Metallurgical Thermodyna-mics 3 Units
Stoichiometry; Law of Conservation of Mass, Blast Furnace Charge Balance Calculations, Materials Balance in Smelting Operation, Calorific Value of Fuels, Combustion of Fuels; Work, Heat 1st Law of Thermodynamics, Heat and Work Changes in Reversible Processes, Heat Capacity, Calculation of Enthalpy Changes, Reversible Adiabatic Process, Energy Balances in Simple Systems, Determination of Theoretical Flame Temperature in Blast Furnace Energy. Consumption in Metallurgical Processes.

MME 720: Metallurgical Instrumen-tation 2 Units
Metallography; Optical Microscopy, Metallurgical Microscope, Special Microscopic Techniques, High-Temperature Metallography; Electron Microscopy, X-ray Metallography, Radiography, X-ray Microanalysis, X-ray Microscopy; Macrostructure Examination of Specimen Surface; Examination of a Macroetched Section, Examination of a Fractured Section, Non- Destructive Testing.

MME:712 Metallurgical Laboratory 2 Units
Experiments on:
1. Mineral processing (mineralogical analysis, jigging, floatation, etc),
2. Extractive metallurgy (metal leaching, metal precipitation, solvent extraction, etc)
3. Foundry (moulding; melting, casting, etc)
4. Optical metallorgraphy (specimen preparation, imaging and quantitative analysis, etc)
5. Materials testing. (Hardness, impact, tensile, fatigue, etc)
6. Heat treatment Experiments (Annealing, quenching, normalizing etc.)
7. Corrosion rate measurements.

MME 717: Extraction and Refining of Materials (Non Ferrous Metals) 2 Units
Outline of major competing routes of metal production from their ores. Limitations and factors influencing the choice of production and refining process i.e. the scientific and technological analysis of extraction processes. Ore treatments techniques (roasting, pressure oxidation, bio-oxidation). Thermodynamics and kinetics of hydrometallurgical processes; leaching. Cementation, precipitation, ion exchange and solvent extraction processes.

Principles of electrometallurgy (electrowinning and electrorefining). Fire refining. Extraction and refining of most common commercial metals such as aluminium, copper, lead, zinc nickel, tin, gold etc.

MME 716: Polymer Technology 1 Units

Chemistry polymerization processes-condensation, polymerization. Addition polymerization. Expoxidepo-polymerization (Fibre glass, carbon fibre materials) synthetic rubbers. Styrene-butadiene rubber. Thermoplastics and thermosetting plastics technology - polymerization system. Molecular weight and melt flow index mould techniques including steam-mould for expanded polystrene. Compression moulding. Projection moulding, extrusion moulding calendaring solid state forming.

MME 715:Physical Metallurgy 2 Units

Transformation Curves (TTT, CCT diagrams); Equilibrium Structures; Annealing and Normalizing; Spherodising; Process Annealing; Austenite-to- Martensite transformation, Martensitic Structures, Tempering of Martensite; Intermediate Phase, Isothermal Transformation; Effect of Composition; transformation during Cooling; Heat Treatment for Hardening. Quenching; Hardenability; Heat-Treating Methods; Engineering Properties of Heat Treated Steels; Low Carbon steels; Medium-Carbon Steels; High Carbon Steels; Heat Treatment of Non-ferrous Metals Aluminum, alloys, Magnesium, Alloys.

MME 719: Engineering Materials 1units

Ceramics; Types of Ceramics Materials Structures and Bonding Mechanics of Ceramic Materials. Characteristics of Vitreous and Crystalline Inorganic Non-Metals. Applications and discussion of Effects of Microstructure on Thermal, Mechanical, Optical and Electrical properties of Materials.

MME 713: Statistical Methods (2 Units)

Descriptive Statistics: Central tendencies and dispersion. Elementary probability theory, Conditional probability, Baye's theorem, probability distributions and applications. Elementary theories of sampling and estimation. Test of hypothesis and significance. Curve fitting, linear and estimation. Test of hypothesis and significance. Curve fitting, linear and multiple regression analysis; linear correlation, analysis of variance, time series analysis. Statistical quality control for mean, standard deviation, range, number of defects etc. Sampling techniques, average sampling number, stochastic processes.

MME 719: Heat And Mass Transfer (3 Units)

Heat transfer by conduction:One-dimensional heat conduction problems and solution. Fourier's equation using energy conservation approach, steady and unsteady state 2 D heat conduction (Lap lace equation, Poisson's equation). Dimensionless variables of heat conduction.
Heat transfer by convection: Basic equations of heat convection. Free and forced convections. Dimensionless numbers and similarity. (Reynolds, Pronate, Grashof, Rayleigh, Station, Nusselt, Frouds Pedet and Greetz numbers). State Buckingham pi theorem, boiling and condensation. Heat transfer radiation: Electromagnetic spectrum, thermal radiation spectrum emissivity, reflectivity, transmisivity, absorbitivity, emissive power. Real and ideal surfaces. Total and monochromatic radiation. • State Kirchoff's law, Wien's displacement, Stephen Boltzman's law. Direct exchange between black and grey surfaces, exchange in enclosures with non-participating medium.Heat Exchangers: Functions of heat exchangers. Basic types of heat exchangers. Analysis of heat exchanger using the Logarithmic Mean Temperature Difference (LMTD) and number of transfer units (NTU) methods Mass transfer: Definition of momentum transfer. Navier stoke's equation analysis of boundary layer theory boundary layer thickness, drag, boundary layer control. Flow through conduits and over submerged bodies (flat plates, cylinders and spheres) 30h (T); 45h (P).

MME 718: Introduction To Engineering Materials (2 Units)

Characteristics and manufacturing methods. Composites, ceramics, and steel, steel grades and use or materials; modem engineering materials and materials for special purposes.

MME 724: Numerical Methods Computer Programming (2 Units)

Gaussian elimination, Gauss-Seidel methods arc Newton-Raphson Heraton methods of solving linear equations. Forward and backward difference tables central difference formula, finite difference solution to practiced differential equations. Solutions of ordinary differential equations (1st and 2nd order) using Runge-Kutta method. Row charting, Algorithms, inputs and output, Basic, FORTRAN and Modern Languages. Computer software analysis, Problems and engineering management.

MME 721: Metals And Materials Process And Plant Design (2 Units)

Design of metallurgical processing system. Method of estimating process cost and profitability performance. Selection and design of process Equipment. Integration of Process units into a working plant and its construction and operation. Design of metallurgical equipment: furnace, ball mills, floatation cells, mixers, sintering plants, metal forming mills e.t.c. Management of construction site. Personal management

MME 731: Law Management And Entre-preneurship (3 Units)

Principles of management. Industrial group and organizational behaviour. Motivation. Industrial law, legislation on wages, trademarks and patents, law of contracts and sales of goods. Liability for industrial injuries. Industrial relations. Trade unions, employer associations, wages

bargaining and role of the state. Relevant topics on entrepreneurship designed by the National Universities Commission for Nigerian Universities Isothermal Transformation; Effect of Composition; transformation during Cooling; Heat Treatment for Hardening. Quenching; Hardenability; Heat-Treating Methods; Engineering Properties of Heat Treated Steels; Low Carbon steels; Medium-Carbon Steels; High Carbon Steels; Heat Treatment of Non-ferrous Metals Aluminum, alloys, Magnesium, Alloys.

MME 719:Engineering Materials (1unit)
Ceramics; Types of Ceramics Materials Structures and Bonding Mechanics of Ceramic Materials. Characteristics of Vitreous and Crystalline Inorganic Non-Metals. Applications and discussion of Effects of Microstructure on Thermal, Mechanical, Optical and Electrical properties of Materials.

MME 713: Statistical Methods (2 Units)
Descriptive Statistics: Central tendencies and dispersion. Elementary probability theory, Conditional probability, Baye's theorem, probability distributions and applications. Elementary theories of sampling and estimation. Test of hypothesis and significance. Curve fitting, linear and estimation. Test of hypothesis and significance. Curve fitting, linear and multiple regression analysis; linear correlation, analysis of variance, time series analysis. Statistical quality control for mean, standard deviation, range, number of defects etc. Sampling techniques, average sampling number, stochastic processes.

MME 719: Heat and Mass Transfer (3 Units)
Heat transfer by conduction:One-dimensional heat conduction problems and solution. Fourier's equation using energy conservation approach, steady and unsteady state 2 D heat conduction (Lap lace equation, Poisson's equation). Dimensionless variables of heat conduction. Heat transfer by convection: Basic equations of heat convection. Free and forced convections. Dimensionless numbers and similarity. (Reynolds, Pronate, Grashof, Rayleigh, Station, Nusselt, Frouds Pedet and Greetz numbers). State Buckingham pi theorem, boiling and condensation. Heat transfer radiation: Electromagnetic spectrum, thermal radiation spectrum emissivity, reflectivity, transmisivity, absorbitivity, emissive power. Real and ideal surfaces. Total and monochromatic radiation. • State Kirchoff's law, Wien's displacement, Stephen Boltzman's law. Direct exchange between black and grey surfaces, exchange in enclosures with non-participating medium.
Heat Exchangers: Functions of heat exchangers. Basic types of heat exchangers. Analysis of heat exchanger using the Logarithmic Mean Temperature Difference (LMTD) and number of transfer units (NTU) methods Mass transfer: Definition of momentum transfer. Navier stoke's equation analysis of boundary layer theory boundary layer thickness, drag, boundary layer control. Flow through conduits and over submerged bodies (flat plates, cylinders and spheres) 30h (T); 45h (P).

MME 718: Introduction to Engineering Materials (2 Units)
Characteristics and manufacturing methods. Composites, ceramics, and steel, steel grades and use or materials; modem engineering materials and materials for special purposes.

MME 724: Numerical Methods Computer Programming (2 Units)
Gaussian elimination, Gauss-Seidel methods arc Newton-Raphson Heraton methods of solving linear equations. Forward and backward difference tables central difference formula, finite difference solution to practiced differential equations. Solutions of ordinary differential equations (1st and 2nd order) using Runge-Kutta method. Row charting, Algorithms, inputs and output, Basic, FORTRAN and Modern Languages. Computer software analysis, Problems and engineering management.

MME 721: Metals And Materials Process And Plant Design (2 Units)
Design of metallurgical processing system. Method of estimating process cost and profitability performance. Selection and design of process Equipment. Integration of Process units into a working plant and its construction and operation. Design of metallurgical equipment: furnace, ball mills, floatation cells, mixers, sintering plants, metal forming mills e.t.c. Management of construction site. Personal management.

MME 731: Law Management And Entre-preneurship (3 Units)
Principles of management. Industrial group and organizational behaviour. Motivation. Industrial law, legislation on wages, trademarks and patents, law of contracts and sales of goods. Liability for industrial injuries. Industrial relations. Trade unions, employer associations, wages bargaining and role of the state. Relevant topics on entrepreneurship designed by the National Universities Commission for Nigerian Universities. explosive techniques; sintering technology: sizing and impregnating; Heat treatment of component produced by powder metallurgy: powder metallurgical techniques in metal protection and repair of worn and corroded components. Current issues in powder metallurgy from high production to nanomaterials.

MME 828 Advanced Metal Joining Processes (3 Units)
Joining of metals: soldering, brazing welding methods: Thermal, chemical, and mechanical aspects of welding processes. Metallurgical aspects of welding including microstructure and properties of the weld. Welding as a special form of manufacturing process involving solidification. Modern techniques of welding, the classification of different weld zones, their origin and the influence on properties and weld design.

MME 830: Advanced Foundry Techno-logy (3 Units)
Advanced technology of moulding and casting processes: Sand mould, permanent mould, plaster mould, shell mould and CO_2 process: Study of such special casting procedures as sand casting, investment casting, centrifugal casting, die casting, continuous casting, etc. Theoretical approach to these casting procedures. Principles of metal solidification: Metal- casting principles including pattern design: sand testing, risering and gating of castings, casting design, and casting defects. Advanced study of the fundamental sciences as applied to metal casting; ceramics and polymers used in the metal-casting industry, the physical chemistry of liquid metal as applied to melting and refining, fluid flow in molds, and the metallurgical. principles affecting the properties of ferrous and nonferrous castings. Quality control and assurance.

MME 832 Advanced Heat Treatment Processes (3 Units)
Review of phase transformation in metals: Theory of heat treatment; Electronic and thermodynamics principles governing the formation of alloy phases: selection of equipment, media, atmosphere and operating conditions. Quenching media characteristics and selection: Heat treatment of cast iron; tool steel; stainless steel and Heat resisting steel. Heat treatment of non-ferrous metals. Nucleation and growth processes in metals with particular reference to austenite formation and decomposition, discontinuous precipitation, particle coarsening, martensitic transformation. Detailed heat treatment of special important commercial materials especially bearing steels, aluminium alloys titanium alloys, nickel based alloys, high strength low alloy steel and stainless steels.

MME 834 Phase Transformation And Experimental Techniques (3 Units)
Nucleation and growth processes. Free energy changes in precipitation. Theories of nucleation and clustering. Heterogeneous nucleation at grain boundaries, stacking faults, dislocation and impurity phases. Precipitation phenomenon-general, localized and cellular precipitation, **structural changes. Gruiner-**Preston zones, intermediate and stable precipitation, and their correlation with property changes. Coherency, order- disorder reactions, coalescence and overaging. Shear transformation, nature and thermodynamics of martensitic transformation, kineticsand crystallographic features of various alloy system, thermal and isothermal transformation. Burst phenomena theory, production of habit planes, orientation relationship and shape deformation. Advanced microscopic techniques and principles of x- ray neutron diffraction techniques; metallurgical analytical techniques, x-ray spectrometric; application of pyrometry, manometry, thermogravimetry, differential thermal analysis; non-destructive techniques, diffraction methods, scanning probe microscopy, transmission electron microscopy, spectroscopic characterization ncluding x-ray, Auger, electron, secondary ion and Rutherford Backscattering, case studies.

MME 836 Fracture Mechanics And Failure Analysis (3 Units)
Fracture mechanisms and mechanics of solid materials. Topics include: nature of brittle and ductile fracture, macro-phenomena and micro-mechanisms of failure of various materials, mechanisms of fatigue failure: crack nucleation and propagation, Griffith theory, stress field at crack tips, stress intensity factor and fracture toughness, crack opening displacement, energy principle and the J-integral, fracture mechanics in fatigue, da/dN curves and their significance. Analysis of failures: case histories of component failures: Practiced examples of fatigue analysis and fundamentals of non-destructive testing.

MME 838 Advanced Corrosion Engineering (3 Units)
The electrochemical basis of corrosion; chemical and electrochemical equilibria; the reaction is other in, electrode potentials and sign conventions, the Nernst equation; electrochemical equilibrium diagrams for electrode kinetics, corroding and non- corroding electrodes electrode polarization; interaction of anodic.

PROJECT 12 UNITS.
Two semesters of more practical research work under the supervision of an academic staff who is a PhD holder and not below the rank of Lecturer I. The project report must be submitted and an oral examination must be conducted.

(c) PhD
MME 999: DOCTORAL RESEARCH PROJECT
For candidate who do not posses an M.Eng or M.Sc in Metallurgical and Materials Engineering or whose transcrips indicate deficiencies in some required courses, the department shall prescribe somme courses, which must be offered during the first year of the programme.

LIST OF ACADEMIC STAFF

S/N	NAME OF LECTURER	Academic Qualification	RANK	AREA OF SPECIALIZATION
1	Prof. Oyetunji Akinlabi	B.Sc. (OAU, 1991), M.Sc (UNILAG 1995) Ph.D Metallurgical Engineering (FUTA 2007)	Professor,	Production Metallurgy (Foundry Technology) in Metallurgical and Materials Engineering
2	Prof. Ade Ajayi John	B.Sc Metallurgical and Materials Eng. (OAU 1984), M.Sc Mechanical Eng. (1990), Ph.D Metallurgical Engineering (Zaria 1998)	Professor	Metallurgical and Mineral Engineering in Metallurgical and Materials Engineering
3	Prof. Borode Joseph Olatunde.	B.Sc. (OAU, 1980), P.hD Metallurgy (Glasgow 1986)	Professor	Extractive Metallurgy in Metallurgical and Materials Engineering
4	Prof. Adewuyi Benjamin.O.	M.Sc. Metallurgical Eng. (1983), Ph.D Metallurgical and Materials Engineering (FUTA 2003)	Professor	Production Metallurgy and Nanostructured Materials Engineering; Experimental and Computational Materials Analysis in Metallurgical and Materials Engineering
5	Prof. Alaneme Keneth. Kanayo.	B.Eng. Met. and Mat. Engineering, (FUT, Owerri 1998), M.Eng. Metallurgical Eng. (FUTA 2002), Ph.D Metallurgical Engineering (FUTA 2007)	Professor	Physical Metallurgy/Mechanical Behaviour of Materials and Structural Integrity in Metallurgical and Materials Engineering
6	Prof. Seidu Saliu Ojo.	B.Eng. (FUTA 1999), M. Eng. (UPB, Bucharest 2006), Ph.D. (UPB, 2009)	Professor	Production Metallurgy (Foundry Technology) in Metallurgical and Materials Engineering
7	Prof. Oloruntoba Daniel Toyin	B.Eng. (FUTA, 1995), M.Eng. (FUTA 2003), Ph.D. Metallurgical and Materials Engineering (FUTA 2010)	Professor	Surface Treatment and Corrosion Engineering in Metallurgical and Materials Engineering
8	Prof. Folorunso Davies Oladayo	B.Sc. Met. and Mat. Engineering, (OAU1992), M.Eng. Mechanical Eng. (FUTA 2000), PhD Metallurgical and Materials Engineering, 2013	Professor	Advanced Ceramic Materials Engineering in Metallurgical and Materials Engineering
9	Prof. Oladele Isiaka O.	B.Eng. Met. And Mat.. Engineering, (FUTA 2000), M.Eng. Met. and Mat. Eng. (FUTA 2006) Ph.D, Mat. Eng. (FUTA 2012)	Professor	Polymer Based Composites in Metallurgical and Materials Engineering
10	Prof. Aramide Fatai Olufemi.	B.Eng. Met. and Mat. Engineering, (OAU, 1997), M.Eng. Metallurgical Eng. (OAU, 2004), Ph.D. Metallurgical Engineering and Materials (2014)	Professor	Advanced Ceramic Materials Engineering in Metallurgical and Materials Engineering
11	Dr. Olaseinde O. Adenike	B.Eng. (1999), M.Eng. (2006),Ph.D. (2013)	Professor	Corrosion Engineering in Metallurgical and Materials Engineering

9.7.6 DEPARTMENT OF MINING ENGINEERING

POSTGRADUATE DIPLOMA (PGD) PROGRAMME IN MINING ENGINEERING

COURSE OUTLINE

1st semester

Course Code	Title	L	T	P	U
MNE 701	Oil and Gas Well Drilling Technology	3	0	0	3
MNE 703	Engineering Mathematics 1	3	0	0	3
MNE 705	Drilling and Blasting	2	0	2	2
MNE 707	Strength of materials	3	0	0	3
MNE 709	Numerical methods and computer program	2	0	0	2
MNE 711	Surface Mining	3	0	0	3
MNE 715	Professional Engineering Practice	2	0	2	2
	TOTAL				18

2nd Semester

Course Code	Title	L	T	P	U
MNE 702	Technology Policy and Development	2	0	0	2
MNE 704	Mine Design	2	1	0	3
MNE 706	Underground Mining	2	1	0	3
MNE 708	Mineral Economics	2	1	0	3
MNE 710	Mine Management, law, Entrepreneurship	2	0	0	2
MNE 712	Mine Ventilation	2	0	1	3
MNE 714	Engineering Maths II	2	0	0	2
	TOTAL				18

3rd Semester

Course Code	Title	L	T	P	U
MNE 721	Petroleum Reservoir Engineering	3	0	3	3
MNE 723	Mine Construction	3	0	0	3
MNE 725	Mineral Processing	3	0	3	3
MNE 727	Mine Survey	3	0	3	3
MNE 729	Field Work	0	0	9	3
MNE 731/733	Electives	3	0	0	3
	TOTAL				18

4th Semester

Course Code	Title	L	T	P	U
MNE 720	Rock Mechanics	3	0	3	3
MNE 722	Mine Equipment and Machinery	2	1	0	3
MNE 724	Seminar	0	0	4	2
MNE 726	Statistics for Engineers	2	0	0	2
MNE 728	Reclamation and Environment	2	0	0	2
MNE 799	Project	0	6	0	6
	TOTAL				18

Electives to be taken in the 3rd Semester

Course Code	Title	L	T	P	U
MNE 731	Applied Operation Research/ Research Methodology	3	0	0	3
MNE 733	Mine Planning and Organization	3	0	0	3

COURSE SYNOPSIS

MNE 701 OIL AND GAS DRILLING TECHNOLOGY (2 UNITS)

Modern techniques for oil and gas well drilling. Drilling rigs; equipment, hoisting, drill string, casing and drill bits. Circulating system, drilling, fluids, muds, drilling hydraulics. Well head equipment, drilling and casing programmes. Drilling performance, offshore drilling rigs. Drilling line design consideration, mud engineering, Functions of drilling mud, types and fundamental properties of drilling mud. Rig hydraulics, Casing design, Function and types of casing, Strength specification and loading. Cementing – functions, classes and types of cement, properties of cement slurry, mechanics of cementing. Hole problems. Site visit.

MNE 703 ENGINEERING MATHEMATICS AND STATISTICS (3 UNITS)
First and second order differential equation with constant coefficient. Simple treatment of partial differential equation. Laplace transformation. Element of probability and probability distribution. Normal, Poisson, binomial and geometric distributions. Test of Hypothesis, F. distribution, regression, correlation and analysis of variance. Contingency table.

MNE 705 DRILLING AND BLASTING (2UNITS)
Classification of drilling and penetration methods. Theories of rock penetration, Basic parameter affected bench drilling i.e. height, burden, spacing and drilling pattern. Choice of drilling equipment. Type of Explosive: Black powder as low explosive, Ammonium Nitrate explosive like dynamite, military explosives, Blasting methods, Explosive Accessories and construction of magazines.
Blasting pattern and disturbance created by blasting

MNE 707 STRENGTH OF MATERIALS (3 UNITS)
Study of different type of materials relevant to mining industries: iron, steel, aluminum, ceramic, wood etc. Bending moments and shear force in beam; failure theories in iron, steel, wood and rock, Mohr circle. Type of failure in rock: plane, circular, wedge mode of slope failure. Support systems in surface and underground mines.

MNE 709 NUMERICAL METHOD AND COMPUTER PROGRAM (2 UNITS)
Solution of algebraic and transcendental equations. Curve fitting. Error analysis. Interpolation and approximation. Zero or non-linear equation to one 'variable'. Systems of linear equations. Numerical differentiation and integration equations. Initial value problems for ordinary differential equation. Background materials for linear multi step methods for IVP of ordinary differential equations. Definition reading to basic formula of linear multi step method. Basic theory of linear multi step methods. Derivation of some basic methods. Application of paradigm, excel Microsoft and petrel software.

MNE 711 SURFACE MINING (3 UNITS)
Introduction to mining, development of mining technology, opening of a mine, stages in the life of a mine, classification of mining techniques, and analysis of surface mining operations. Type of surface of mining techniques, similarities and differences; ore estimation, grade control, reserve estimation short and long range planning. Advantages and disadvantages of surface mines. Surface excavation, ore estimate, grade control, short and long range planning unit operations, equipment, case studies of typical surface mines, coal metals and non-metallic mines.

MNE 715 PROFESSIONAL ENGINEERING PRACTICE (3 UNITS)
Philosophy of Science. History of engineering and technology. Safety in Engineering and Introduction to risk analysis. The role of Engineers in nation building. Education and Training of Engineers. Industry, Commerce and Management. Professional practice (bodies) - NSE, COREN, COMEG, MNGS, Technology transfer, Nigerian - SAT 1 and its application to Mining Engineering.

MNE 721 PETROLEUM RESEVOIR ENGINEERING (2 UNITS)
Introduction to hydrocarbon reservoir. Rock and fluid properties. Mechanics of fluid flow in porous media. Reservoir drive mechanism. Composition of petroleum, material balance applied to oil reservoirs. Introduction to enhanced oil recovery methods. Well completions. Well tests, production tests, and routing tests, steady and unsteady flow equations. Engineering and routing tests, pressure build-up survey, well flow monitoring and measurement. Well simulation

MNE 723 MINE CONSTRUCTION (2 UNITS)
Factors affecting the sitting of shafts, adits etc. Shaft sinking, tunneling and construction of roadways, drifts, headings etc. Drainage systems in surface and underground mines. Different support methods e.g. wood, steel, and concrete. Selection of a suitable support system in a mine.

MNE 725 MINERAL PROCESSING (2 UNITS)
Ore sampling techniques and communition theory, Dewatering, Flocculation and dispersion, theory and practice of thickening, Filtration and drying, criteria for selection of grinding and screening equipment for mineral concentration techniques. Selection of mineral concentration techniques, and Design, testing and evaluation of mineral
Beneficiation flow sheets for copper, tin, lead, zinc, iron, gold and other ores of local importance. Material handling method and tailing disposal.

MINE 727 MINE SURVEY (2 UNITS)
Instrument use in topographical mine survey. The work of mine surveyor during exploration, opening, development and mining. Traversing on surface and underground mines. Orientation of one vertical shaft and

two vertical shaft. Different methods of reserve estimation. Leveling work in an underground mine. The use of GPS and GIS.

MNE 729 FIELD WORK (3 UNITS)
This is an intensive field work designed to expose the students to most of the rudiments of the mining engineering profession. It is a practical exposure covering mine survey, geometrical mapping of mineral deposits, mining methods, geotechnical investigation, mineral processing. The field work is carried out at such relevant places as existing mining operations (surface and underground), processing and smelting plants, unexploited mineral deposits, petroleum and gas facilities and other relevant places. The field work is designed for a period of four weeks commencing at the end of Course work. The students are required to prepare a technical report of the entire field work and present a seminar on the field programme. The field work is thereafter assessed for grading

MNE 731 APPLIED OPERATION RESEARCH (3 UNITS)
Overview of operations research. Application of operation research techniques in mining and mineral processing: Network analysis, decision theory, queuing theory, linear programming, replacement theory, critical path analysis, investment appraisal etc.

MNE 733 MINE PLANNING AND ORGANIZATION (3 UNITS)
Basic concepts. Routing planning of mining works, Drilling and blasting, extraction, coding haulage and waste disposal. Use of organization network in mine planning and design. Planning of development work e.g. construction of drift and headings. Technical economical indices required during mine design.

SECOND SEMESTER

MNE 702 TECHNOLOGY POLICY AND DEVELOPMENT (2 UNITS)
History of Technology and its development, utilization of technology as an economic resource in Nigeria. Science, technological knowledge and productive capacity. Implication for planning in a developing economy. The role of Research and Development to the development of a nation. Scientific infrastructure and structure of science- based industry. Mechanisms of technology transfer. Technology policy-design and implementation Nigeria.

MNE 704 MINE DESIGN (3 UNITS)
Design of surface and underground excavation methods, Design of drilling and blasting methods, Design of Roadways, shaft, ventilation system, drainage system and magazines. Individual student design work to be carried out. Shaft sinking and different methods available. Determination of the width and depth of bench. Calculation of the amount of explosives required for rocks and minerals fragmentation.

MNE 706 UNDREGROUND MINING (3 UNITS)
Detail study of different underground mining methods to include adit, drift, open stopping, Borehole, level etc. The design of typical mining methods for each operations. Cost estimation in production, transportation and scale underground equipment, drainage ventilation and control of subsidence.

MNE 708 MINERAL ECONOMICS (3 UNITS)
Role of mineral industries in national development with emphasize on developing countries like Nigeria. Variation in ore grade, non-renewable asset, increases in funding with increase in depth; wealth conservation. Global production and consumption pattern of major mineral commodities. Structures of established mineral market, supply and demand, mineral pricing. Projecting and fire lasting methods, market research, mine legislation and the mineral industry. Public and the mineral act, Mineral disposal system, mineral taxation policy.

MNE 710 MINE MANAGEMENT, LAW AND ENTREPRENEURSHIP (3 UNITS)
Basic concept of management. Management structure. General principles functions and responsibilities of management under planning, organization directing, controlling and coordinating. Different forms of business organizations and entrepreneurship. Wage systems. Industrial relations. Nigerian mining laws, Acts and Regulation.

MNE 712 MINE VENTILATION (2 UNITS)
Fundamentals of mine ventilation. Techniques for the control of dust, temperature, humidity, gas. Physiological effects and dangers of poor mine ventilation. Basic principles of mine ventilation design. Simple calculations of flow of air through ducts and mine opening. Equipment selection, instrumentation and air measurements. Evaluation of efficiency of ventilation systems. Testing of refrigeration equipment, test of air-conditioning equipment, lack detection methods: Charging and other service procedures for refrigeration and air-conditioning systems. Trouble shooting. Construction of air ducts.

MNE 714 ENGINEERING MATHS II (2 UNITS)
Series solutions of second order linear equations. Based, Legendre and hyper geometric equations and functions. Gamma, Beta functions, sturm-liovelle problems. Orthogonal polynomials and functions. Former, /Formier Bessel and Formier- Legendre series. Four transformation. Solution of Laplace, ware and heat equations by Fourier methods.

MNE 720 ROCK MECHANICS (3 UNITS)
Rock strength and failure criteria. Common laboratory strength tests: Uniaxial, Triaxial, Brazilian, Flexural tests, stress - strain behaviour in compression. The Mohr-Colum failure criterion, the effect of water, the influence of the principal/stress ratio on failure. Empirical criterion of failure. Elastic properties. Application of rocks mechanics in engineering or underground openings. Rock slope stability, support systems, design and selection - caving and subsidence.

MNE 722 MINE EQUIPMENT AND MACHINERY (3 UNITS)
Pumps and their characteristics. Excavators e.g. draglines bucket excavators. Dredges and coal cutter and their uses. Selection of support systems in long wall faces. Different type of transport machines, such as belt conveyor, roadways, railways, rope and aerial transport system. Hoisting machine. Coal cutters and their uses.

MNE 724 COURSE SEMINAR (2 UNITS)
Review of literature in the area of Mining Engineering. Students write up will be supervised
and graded by assigned lecturer for score up to 40 while the seminar is 60, making a total of 100.

MNE 726 STATISTIC FOR ENGINEERS (2 UNITS)
Elements of probability and probability distribution; normal, binomial, poison, geometric, Negative binomial distributions. Estimation and tests of hypothesis concerning the parameters of distribution. Regression, correlation and analysis of vaviance contingency table. Non-parametric inference. Subjection of Data to Bar chart, Polygon, Pie chart, and Histogram. Basic sampling methods Stratification. Use of auxiliary mean and total in simple and in stratified random sampling. Methods of social investigation; design of surveys, errors and bias, methods of collection of data, processing analysis and interpretation.

MNE 728 MINE RECLAMATION & ENVIRONMENT (3 UNITS)
Stripping ratio determination: overburden and ore characteristics, strength of overburden and ore. Venn and massive type of ore in underground mines. Type of entry of underground mines; method of entry. Adit, shaft etc. Underground ore reserve estimation methods, planning and development of underground mine opening. Advantages and disadvantages of underground mines.

MASTERS OF ENGINEERING (M.ENG)

PROGRAMME IN MINING ENGINEERING

Course Outline

APPLIED ENGINEERING GEOTECHNICS

COURSE CODE	TITLE	L	T	P	U
MNE805	Structure/Construction in Underground Mines	2	0	3	3
MNE807	Applied Geostatistics	3	3	0	3
MNE815	Mine Environment and Land Reclamation	3	0	0	3
MNE817	Applied Rocks Mechanics	2	0	3	3
MNE821	Database Design and Analysis of Experiment	3	0	0	3
MNE823	Finite Element Methods	3	0	0	3
MNE827	Research Methodology	2	0	0	2
	Total				20

SAFETY AND MINE ENVIRONMENT

COURSE CODE	TITLE	L	T	P	U
MNE813	Mineral and Metallurgical Plant Design	2	0	3	3
MNE815	Mine Environment and Land Reclamation	2	0	3	3
AGY821	Groundwater Hydrology	3	0	0	3
MNE821	Data Base Design & Analysis of Experiments	3	0	0	3
MNE827	Research Methodology	2	0	0	2
	Total				14

MINE SURVEYING AND GIS

COURSE CODE	TITLE	L	T	P	U
MNE801	Engineering Surveying	2	0	3	3
MNE805	Structure/Construction of Underground Mines	2	0	3	3
NE807	Geostatistics	3	0	0	3
MNE821	Data Base Design and Analysis of Experiment	3	0	0	3
MNE827	Research Methodology	2	0	0	2
	Total				14

APPLIED OPERATIONS RESEARCH IN MINING

COURSE CODE	TITLE	L	T	P	U
MNE805	Structure/Construction in Underground Mines	2	0	3	3
MNE813	Mineral and Metallurgical Plant Design	2	0	3	3
MNE803	Operations Research	2	0	3	3
MNE823	Finite Element Methods	3	0	0	3
MNE825	Mathematical Methods II	3	0	0	3
MNE827	Research Methodology	2	0	0	2
	Total				17

MINE VENTILATION

COURSE CODE	TITLE	L	T	P	U
MNE827	Mine Ventilation	2	0	3	3
MNE805	Structure/Construction in Underground Mines	2	0	3	3
MNE803	Operations Research	2	0	3	3
MNE815	Mine Environment and Land Reclamation	3	0	0	3
MNE821	Data base design & analysis of experiment	3	0	0	3
MNE827	Research Methodology	2	0	0	2
	Total				17

SURFACE MINING

COURSE CODE	TITLE	L	T	P	U
MNE805	Structure/Construction in Underground Mines	2	0	3	3
MNE809	Techniques/Mechanization of Surface Mines	2	0	3	3
MNE811	Mine Transport	2	0	3	3
MNE815	Mine Environment and Land Reclamation	3	0	0	3
MNE821	Data Base Design & analysis of experiment	3	0	0	3
MNE827	Research Methodology	2	0	0	2
	Total				14

UNDERGROUND MINING

COURSE CODE	TITLE	L	T	P	U
MNE809	Techniques/Mechanization of Surface Mines	2	0	3	3
MNE805	Structure/Construction of Underground Mines	2	0	3	3
MNE807	Geostatistics	3	0	0	3
MNE811	Mine transport	3	0	0	3
MNE821	Data Base Design and analysis of experiment	3	0	0	3
MNE827	Research Methodology	2	0	0	2
	Total				17

MINE MANAGEMENT & MINERAL ECONOMICS

COURSE CODE	TITLE	L	T	P	U
MNE809	Techniques/Mechanization of Surface Mines	2	0	3	3

MNE801	Management Information System	2	0	3	3
MNE802	Statistical Design & Analysis of Experiments	2	0	3	3
MNE803	Operations Planning & Management	3	0	0	3
MNE804	Economics Of Mining	3	0	0	3
MNE827	Research Methodology	2	0	0	2
	Total				17

MINERAL PROCESSING TECHNOLOGY

COURSE CODE	TITLE	L	T	P	U
MNE805	Structure/Construction of Underground Mines	2	0	3	3
MNE809	Techniques/Mechanization of Surface Mines	2	0	3	3
MNE811	Mine Transport	3	0	0	3
MNE813	Mineral and Metallurgical Plant Design	2	0	3	3
MNE821	Data Base Design and Analysis of Experiment	3	0	0	3
MNE827	Research Methodology	2	0	0	2
MNE829	Advanced Applications of Commination and Ancillary Operations	3	1	2	3
	Total				20

ELECTIVES

COURSE CODE	TITLE	L	T	P	U
MNE810	Legal Environment Of International Business Org.	2	0	0	2
MNE811	Introduction To Financial And Management Accounting	2	0	0	2

RESEARCH PROJECT FOR ALL OPTIONS

COURSE CODE	TITLE	L	T	P	U
MNE899	Master's Thesis Research Project	0	0	18	6

SECOND SEMESTER

APPLIED ENGINEERING GEOTECHNICS

COURSE CODE	TITLE	L	T	P	U
MNE806	Applied Explosives Engineering	3	0	0	3
MNE808	Rock Slope Engineering	2	0	0	3
MNE812	Roof and Ground Control Engineering	2	0	0	3
MNE814	Pollution Control Engineering	3	0	0	3
MNE826	Mechanics and Engineering of Soil Materials	3	0	3	3
	Total				15

SAFETY AND MINE ENVIRONMENT

COURSE CODE	TITLE	L	T	P	U
MNE822	Health and Safety Law in Mining Industries	2	0	2	3
MNE806	Applied Explosives Engineering	3	0	0	3
MNE820	Mine planning and organization	2	0	0	3
MNE812	Roof and Ground Control Engineering	2	0	0	3
MNE814	Pollution Control Engineering	3	0	0	3
	Total				**15**

MINE SURVEYING

COURSE CODE	TITLE	L	T	P	U
MNE816	Mine surveying	3	0	0	3
MNE804	Advanced Mineral Economics	2	0	0	3
MNE820	Mine Planning and Organization	2	0	0	3
MNE824	Photogrammetry	3	0	0	3
	Total				12

APPLIED OPERATIONS RESEARCH IN MINING

COURSE CODE	TITLE	L	T	P	U
MNE804	Advanced Mineral Economics	3	0	0	3
MNE806	Applied Explosive Engineering	2	0	0	3
MNE810	Decision Theory for Managers	3	0	0	3
MNE808	Rock Slope Engineering	2	0	0	3
MNE814	Pollution Control Engineering	3	0	0	3
	Total				15

MINE VENTILATION

COURSE CODE	TITLE	L	T	P	U
MNE802	Applied Mine Ventilation	2	0	3	3
MNE822	Refrigeration and Air Conditioning	2	0	0	3
MNE814	Pollution Control Engineering	3	0	0	3
MNE822	Health and Safety Law in Mining Industries	2	0	2	3
	Total				12

SURFACE MINING

COURSE CODE	TITLE	L	T	P	U
MNE806	Applied Explosives Engineering	3	0	0	**3**
MNE808	Rock Slope Engineering	2	0	0	**3**
MNE820	Mine Planning and Organization	2	0	0	**3**
MNE814	Pollution Control Engineering	3	0	0	**3**
	Total				**12**

UNDERGROUND MINING

COURSE CODE	TITLE	L	T	P	U
MNE806	Applied Explosives Engineering	3	0	0	3
MNE802	Applied Mine Ventilation	2	0	0	3
MNE812	Roof and Ground Control Engineering	2	0	0	3
MNE818	Techniques/Mechanization of Underground Mines	3	0	0	3
MNE816	Mine Surveying II	3	0	0	3
	Total				15

MINE MANAGEMENT AND MINERAL ECONOMICS

COURSE CODE	TITLE	L	T	P	U
MNE818	Techniques/Mechanization of Underground Mines	3	0	0	3
MNE805	Mine Management & Labor Relations	3	0	0	3
MNE806	Managerial Economics	2	0	0	2
MNE807	Health and Safety Law in Mining Industries	2	0	0	2
MNE808	Advanced Mineral Economics	3	0	0	3
MNE809	Course Seminar	0	2	0	2
	Total				15

MINERAL PROCESSING TECHNOLOGY

COURSE CODE	TITLE	L	T	P	U
MNE804	Advanced Mineral Economics	2	0	2	3
MNE814	Pollution Control Engineering	3	0	0	3
MNE820	Mine planning and organization	2	0	0	3
MNE822	Research Methodology	2	0	0	3
MNE828	Advanced Applications of Mineral Processing Techniques	3	0	0	3
	Total				15

RESEARCH PROJECT FOR ALL OPTIONS

COURSE CODE	TITLE	L	T	P	U
MNE899	Master's Thesis Research Project	0	0	18	6

COURSE SYNOPSIS

MNE 801 MINE SURVEYING I (3unit)
Mine surveying works in underground mine: basic principles of underground surveying; system co-ordinate of mine surveying plan. Mine surveying work on driving mining works: Understanding of Mine Survey work in contact with various mining face. Mine survey work in opening and development of underground mining work. Application of remote sensing and GPS in mine surveying. Mine surveying plans and map of underground mining works: Projection of horizontal/vertical profile on strike and dip of underground mineral layer.

MNE 803 OPERATIONS RESEARCH METHODS (3unit)
Importance of operations research in the solution engineering problems. Allocation models, including the simplex procedure of linear programming, transportation and assignment models; network analysis, critical path analysis, inventory theory and control, investment appraisal, queuing theory and simulation, Monte Carlo techniques, integer programming introduction to nonlinear programming, dynamic programming, reliability and replacement

MNE 805
STRUCTURE/CONSTRUCTION OF UNGERGROUND MINES (3unit)
General construction parameters. Geological physical, regulatory and operational parameters. Construction of horizontal and incline mining galleries, shaft station and chambers using blasting methods and tunneling machines. Selection of tunneling machinery.

MNE 807
GEOSTATISTICS (3unit)
Introduction to application and theory of geo-statistics in mining industry. Review of elementary statistics and traditional ore reserve calculation techniques. Concept of geostatistics. Regionalized variables, design of sampling programs, variogram; semivariogram; volume variance relationship; valuation of ore blocks. Kriging, geostatistics estimation of mineral deposit. Presentation of fundamental geo-statistical concepts, including Variogram, estimation variance block variance, kriging, geo-statistical simulation. Emphasis on the practical aspects of geo-statistical modelling in mining. Stochastic simulation with Gaussian, indicator, and annealing-based methods. Important subjects such as uncertainty quantification, volume-variance relations, and modelling multiple variables will also be addressed. Formulation of models of engineering problems and industrial systems for experimentation using a general-purpose simulation language. Statistical and operational validation of simulation results.

MNE 809 SEMNAR (3units)
Each student in the M.Engr. Programme of the Mining Engineering Department shall select an appropriate topic in any area of mining engineering and develops this for presentation as seminar. The mode of presentation shall be in Microsoft PowerPoint. Results of any programmes written, drawings, charts and tables shall be imported to the PowerPoint document from the programme document in form of screen print, bitmap or active simulation. The seminar shall be held in the third week after the mid-semester break for the second semester of the session.

MNE 811 MINE TRANSPORT (3unit)
General analyses of type and mode of transportation in the mining industries, and there classification. Conveyor transport, parameters, design and selection. Rail transport system. Automobile transport system. Auxiliary transport. Design of transport system in the mining industry.

MNE 813 MINERAL & METALLURGICAL PLANT DESIGN (3unit)
Advanced Principles of Mineral and Metallurgical Plant Design, Problems of Plant Design, location, safety. Detailed equipment procurement procedure. Design of disposal areas, demand tanks, pipes, costs estimating. Identification of materials for Mill construction, foundations framework, walls roof, windows, floors and painting. Practical Design. Case studies of mineral processing plants. Rolling mills steel mills and coal treatment plants.

MNE 815 MINE ENVIRONMENT & LAND RECLAMATION (3unit)
Land as a resource. Types and sources of land disturbance and dereliction. Derelict land survey. Environmental quality; environmental audit and impact assessment. Assessment of mine and mill waste. Impacts of mining on microbial organism. Reclamation techniques. Restoration of reclaimed land. The establishment, management and maintenance of self-sustaining natural vegetation of degraded land.

MNE 817 APPLIED ROCK MECHANICS (3unit)
Rock as a material. Stress energy concepts in rock mechanics. Concepts of shear and triaxial strengths in discontinuous rock media. Analysis of stress and infinitesimal strain, friction, elasticity and strength of rock. Linear plasticity. The state of stress underground. Examination of the various stability analysis methods for rock slopes and underground excavations. Underground measurements, laboratory testing. Mining and other engineering applications.

MNE 819 APPLIED MINE GEOMETRY (3unit)
Theoretical basis for geometry and geometry of the lands mathematical interpretation and models of displacement of land; geometric analysis of geo-chemical deposit. Methods and types of mine geometry. Graphic solution with steronet. Determination of correlations between deficient parameters in mineral deposit. Multiple correlation.
Geometry parameters of mineral layers, their determination and documentation. Survey and documentation of borehole. Thickness and depth of mineral layers and their graphical representations. Linear and planar structures in tectonites.

MNE 821 DATA BASE DESIGN & ANALYSIS OF EXPERIMENT (3unit)
Files, computation on data base, Hierarchical view of data, descriptions, binding, classification of operating systems, applications. Data base structures; models semantics of relations, operations on models, design of data models (.e.g. Hierarchical relational network) scheme protection, data base operation and management.

MNE 825 MATHEMATICAL METHODS II (3unit)
Calculus of variation: Hamilton's principles. Lagrange's equations and geodesic problems. Variatical formulation of boundary and initial value problems. Integral transforms: Laplace, Fonrier and Hankel transorms. Complex variable methods. Convolution theorems. Application to solution of differential equations. Integral equation: Methods of successive approximation. Integral equation with symmetric kernels, Fredholm alternatives.

MNE 827 RESEARCH METHODOLOGY
Overview of types of research. Formulation of research question/objective. Literature survey. Development of appropriate research methodology. Design modes and sampling techniques. Data presentation method and analysis – statistical analysis etc Writing research report and writing of a good research proposal

MNE829 ADVANCED APPLICATIONS OF COMMINUTION AND ANCILIARY OPERATIONS IN MINERAL PROCESSING (3units)
Commination theory and mineral liberation process. Selection principles for commination equipment. Particle classification, size analysis and size classification equipment selection. Dewatering in mineral processing plants. Transportation, feeding and conveying within the mineral processing plant (the belt conveyor, pipelines, pumps - slurry pumps, slurry lines, pump boxes and launders). Practical experiments in commination and dewatering. Drying and storage equipment – dryers, stackers, reclaimers etc. Tailings and Wastes handling. Design of commination and material handling Circuits. Equipment design principles.

MNE 831 GROUNDWATER HYDROLOGY (3unit)
The hydrologic cycle. Flow through porous media, equation of flow and the continuum theorem. Groundwater aquifers/reservoirs as sources of water for mining, processing and other industrial operations. Characteristics of aquifers and geological factors that influence them. Groundwater modeling and flow simulation. Application of statistical methods in hydrological data analyses. Groundwater and well engineering – well sinking, borehole data collection, analyses and pumping tests. Saline water intrusion and coastal hydraulics. Groundwater resources and basins of Nigeria. Groundwater system recharge, run off and

flooding/flood control. Hydrological mapping and its applications.

MNE 899 MASTER'S THESIS RESEARCH (THESIS) (12 UNITS)
Student will carry out original project on approved topics in areas of mineral Economics on mine management. The research, which outcome should contribute to knowledge, could be investigative, basic or applied and is expected to be directed at solving an identified problem related to mineral industries. The student will be expected to make an oral presentation in the departmental seminars. The research will be done under the supervision of one or two senior academic staff.

SECOND SEMESTER

MNE 802 APPLIED MINE VENTILATION ENGINEERING (3unit)
Review of some elementary thermodynamics and psychrometrics. Airflow through roadways and ducts. Mechanical ventilation equipment. Natural ventilation, network, instruments. Ventilation surveys. Ventilation planning and economics.

MNE 804 ECONOMIES OF MINING (3 UNITS)
The fundamental factors critical to the evaluation of a mineral deposit. Evaluation of objectives. Selection of capacity and cut-off grade, operating and capital costs, profitability, risks and reform on mining investment, forecasting and production planning for equipment utilization, drilling and blasting.

MNE 806 APPLIED EXPLOSIVE ENGINEERING (3units)
Explosives and materials for their preparation. Classification of explosives. Manufacturing processes in explosives technology. Uses of explosives. Application of explosives in the extractive industry: solid mineral exploration, search for oil and gas, engineering construction, geotechnics surveying, surface and underground mineral exploitation, wastes disposal etc. Explosives storage and construction of magazines. Transportation of explosive materials. Regulations governing possession, production and distribution of explosives. The role of the Federal Ministry of Mines Steel and Solid Minerals Development and other relevant government agencies in the regulation of explosives.

MNE 808 ROCK SLOPE ENGINEERING (3unit)
Understand the concept of stability in Mines. Factors contributing to rock slope failures, Planning slope stability investigation. Classification of slope instabilities, Basic mechanics of slope failures, geotechnical data collection and evaluation, analysis of different types of failures. Circular, Plane, wedge and toppling.

MNE 810 LEGAL ENVIRONMENT OF INTERNATIONAL BUSINESS (2 UNITS)
Basic legal issues that are relevant in international business, including legal risks of entering foreign markets, international organization, trading block, sales contract, legal aspects of bills of lading especially for solid minerals, oil and gas. Opening of letter of credits, liability of ocean carriers, licensing and resolution of international disputes.

MNE 814 POLLUTION CONTROL ENGINEERING (3unit)
An overview of the earth and its environment. Advanced topics in stream pollution. Acid mine drainage (AMD), Effect of mineral processing pollution on rivers, wild life etc. Advanced topics on air pollution. Effect of pollutions on the environment. Case studies. Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management – Salient features of Nigeria legislations on management of hazardous wastes and fly ash; Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Waste Characterisation and reduction of source generation: Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes – Recycling and reuse – Waste exchange; Storage, Collection , Disposal and Transport of Waste: Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection system-Optimizing waste allocation– compatibility, storage, labelling and handling of hazardous wastes – hazardous waste manifests and transport. Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills.

MNE 816 MINE SURVEYING II (3unit)
Mine Surveying in surface mining system: Concept; Surveying work in opening and development of surface mine; Mine Surveying work in construction of highway, haulage, drainage systems in a surface mine. Estimation of mineral reserves.
Errors and their adjustments; measures of precision, uses of the terms standard error and standard deviation, rejection of doubtful observations, weighted observations confidence intervals, propagation of

systematic errors; propagation of standard or random errors, adjustment by method of least squares.

MNE 820 MINE PLANNING AND ORGANIZATION (3unit)

Basic concepts: Management as a function of mine planning and organization. Routing planning of mining works: drilling and blasting, extraction-loading, haulage and waste disposal, preventive maintenance schedules for equipment, schedules for work to be done on mine faces; and weekly-daily programs. Organization of technological work schedule in mining. Use of organization loop in mine planning and organization.

MNE 822 HEALTH AND SAFETY LAW IN MINING INDUSTRIES (3units)

General safety in the Mining industry. Safety during charging and blasting operations. Safety during surface and underground operations. Safety during shaft sinking and construction of mining galleries. Safety during the transportation of materials and exploited minerals. Safety during the use of pneumatic and electrical energies. Gas explosion and rock burst in mines-causes and control. Endogenic and endothermic fires-causes and control. Safety during the use of mine equipment and machineries. Introduction to Accident Prevention and Health & Safety in Industry: Terminology. Accident statistics and trends in mining industry; Safety Risk in Opencast and Underground Mines; Risk Assessment: Concepts, Qualitative and Quantitative Approaches; Components of Risk Assessment: Risk Identification, Risk Estimation and Evaluation; Risk Analysis using FTA,HAZOP, ETA etc.; Risk Analysis Software's; Heath Risk Assessment and Epidemiological Studies; Statistical and Economic Analysis of Accident Data; Risk Minimization Techniques in Mines; Generic approach to loss control within mining operations; Safety Policies, Safety Audit and Safety Management in Mines; Application of Virtual Reality for Safety, Training and Marketing; Case studies on Safety Risk Assessment in Mining and allied industries

MNE 824 PHOTOGRAMMETRY (3unit)

Principles of photogrammetry. Types of photogrammetry: terrestrial and aerial. Ground photo theodolite. Determination of point (station) co-ordinates and spot level using ground photo theodolite. Air survey cameras. Air photographs; scale of a photograph; distortion of air photograph; stereoscopic pairs; stereoscopy, flight planning. Control and uncontrol (mosaic radial assumption; plotting from air photographs – radial line plotter, principal-point radial line plotting, reduction to scale, slotted template, heighten, parallax bar or stereo meter. Airborne profile recorder plotting machines, uses of air photography, application of air photograph in the numerical industry**.**

MNE 826 MECHANICS AND ENGINEERING OF SOIL MATERIALS (3units)

Engineering description of soil, origin of soil, rock – soil relationship, Soil properties determination, soil classification. Atterberg limits-particle size distribution. Shear strength of soil, stresses in soils, earth pressures and bearing capacity. Soil - water relationship (void ratio, porosity specific gravity etc.) Flow of water in soils - ground water flow, seepage and permeability. Basic knowledge of soil site investigation techniques, principles, practice and tools. Field data acquisition and representation methods. Standard soil tests and their uses. Geotechnical data integrity and acquisition techniques with the geographic information systems (GIS). Rock / soil mass mapping. Design of reinforcement for soil excavation. Soil mass failure and their prevention. Practical site investigation, case studies and simulated industrial experience

MNE 828 ADVANCED APPLICATION OF MINERAL SEPARATION TECHNIQUES (3units)

Mechanics of fluid in mineral separation. Classification of separation processes: solid – solid separation, Solid - liquid separation (Gravity, Heavy Media, Centrifugal classification, electrical method, magnetic separation etc.) Hydrometallurgical separation processes. Advanced application of separation processes. Process selection for the recovery of some minerals. Equipment selection, sizing and proportioning in mineral separation. Sampling and sampling equipment. Process equipment selection, design and application.

LIST OF ACADEMIC STAFF IN THE DEPARTMENT OF MINING ENGINEERING

S/N	Name	Status	Area of Specialization	e-mail address	Phone number
1.	Prof. Muyideen Alade Saliu	Professor	Rock Mechanics and Surface Mining	masaliu@futa.edu.ng	07066693979
2.	Prof. Zacheus Olaniyan Opafunso	Professor	Surface Mining/Mining Law, Mine Management and Mineral Economics	zoopafunso@futa.edu.ng	08033505007
3.	Prof. Boluwaji Muriana Olaleye	Professor	Rock Mechanics/Rock Engineering	bmolaleye@futa.edu.ng	08034481461
4.	Prof. Babatunde Adebayo	Professor	Surface Mining and Drilling Engineering	badebayo@futa.edu.ng	08060981990
5.	Prof. Ebenezer Oyedele Ajaka	Professor	Mineral Processing and Mineral Processing Plant Design	eoajaka@futa.edu.ng	08035930572
6.	Prof. Thomas Busuyi Afeni	Professor	Mine Surveying and Photogrammetry	tbafeni@futa.edu.ng	07065551448
7.	Prof. (Mrs) Mbuyi Mata Melodi	Professor	Mine Management and Mineral Economics	mmmelodi@futa.edu.ng	08034877647
8.	Prof. Victor Abioye Akinbinu	Professor	Rock Engineering And Rock Fragmentation, Mine Environment	vaakinbinu@futa.edu.ng	08038520736
9.	Dr. Musa Adebayo Idris	Reader	Surface Mining and Rock Mechanics	maidris@futa.edu.ng	07060928848
10	Dr. Gafar Omotayo Oniyide	Reader	Surface Mining and Rock Mechanics	gooniyide@futa.edu.ng	08102043388
11.	Dr. Olanrewaju Clement Alaba	Reader	Mine Safety and Environment, Surface Mining	ocalaba@futa.edu.ng	08062077774
12.	Dr. Ayodele Olumuyiwa Owolabi	Reader	Mine Safety and Environment	aoowolabi@futa.edu.ng	08036558466
13.	Dr. Eyitayo Oluwaseyi Ifelola	Senior Lecturer	Mine Environment	eoifelola@futa.edu.ng	08035316141
14.	Dr. Abiodun Ismail Lawal	Senior Lecturer	Surface Mining and Geotechnical Engineering	ailawal@futa.edu.ng	08067568693
15.	Dr. Ismail Adeniyi Okewale	Senior Lecturer	Rock Mechanics and Geotechnical Engineering	iaokewale@futa.edu.ng	08067366310
16.	Dr. Patrick Adeniyi Adesida	Senior Lecturer	Surface Mining	paadesida@futa.edu.ng	08038224987
17	Dr. Adeyinka Oluwayomi Omotehinse	Senior Lecturer	Surface Mining and Mine Planning	aoomotehinse@futa.edu.ng	09139062033

9.8 SCHOOL OF LIFE SCIENCE (SLS)

9.8.1 DEPARTMENT OF BIOCHEMISTRY (BCH)

1. RESEARCH INTERESTS

The present research activities of the department span the underlisted areas of biochemistry:

(a) Nutritional/ Food biochemistry
(b) Toxicology
(c) Enzymology and protein chemistry
(d) Membrane/Lipid biochemistry
(e) Medical biochemistry

The research carried out has on one hand a focus on the development of new biological materials with industrial applications and also basic molecular/ cell research for teaching and curriculum development on the other

2 PROGRAMME OFFERED

(a) Post graduate Diploma in Biochemistry.
(b) Master of Technology, M.Tech. (Applied Biochemistry)
(c) PhD Applied Biochemistry

3 AVAILABLE OPTIONS/SPECIALIZATION

(a) Post graduate Diploma (PGD)
  (i) Clinical Biochemistry
  (ii) Applied Biochemistry

(b) M.Tech Applied Biochemistry with specialization in
  (i) Enzymology
  (ii) Fermentation Biotechnology
  (iii) Toxicology
  (iv) Microbial Biochemistry
  (v) Clinical Biochemistry
  (vi) Food Biochemistry

4.0 PHILOSOPHY AND OBJECTIVES.

The primary objectives of the postgraduate Diploma in Biochemistry are to:

(i) Enable graduates of Pure/Applied Biochemistry and Clinical Biochemistry with weak grades ugrade their knowledge, and quantity to pursue higher degree programme in Clinical or Applied Biochemistry.
(ii) Bridge the gap between the HND, AIMLT Programmes (and equivalent) and our first degree programme so as to enable the former to pursue higher degrees in Clinical or Applied Biochemistry.
(iii) Enable graduate in related discipline who are presently employed in food, medical, pharmaceutical and other related industries to pursue degrees in clinical or Applied Biochemistry.

5.0 ADMISSION REQUIREMENTS

Candidates seeking admission into the programme must possess any of the following:

(i) A bachelor's degree in Clinical/Applied Biochemistry with minimum of third class degree.
(ii) A bachelor's degree in Microbiology, Food science and Technology, Pure Biochemistry and other related discipline
(iii) HND/FINAL Diploma (AIST/AIMLT) in chemistry/ biochemistry option and any other related option with a minimum pass at credit level.

6.0 DURATION OF PROGRAMME

A postgraduate Diploma student can qualify for a PGD after a minimum of three (3) semesters (18 months).

7.0 REQUIREMENTS FOR GRADUATION

Candidates are expected to submit and pass a research project in addition to course units totalling a minimum of 30 units.

COURSE OUTLINE

a. P.G.D. Clinical Biochemistry option

First semester:

Course Code	Course Title	L	T	P	U
BCH 720	Research Project	0	0	9	3
BCH 721	Introduction to carbohydrate Biochem.	2	1	0	3
BCH 723	Metab. of aminoacid and proteins.	2	1	0	3
BCH 725	Lipid Biochemistry	2	0	0	2
BCH 727	Intro. To Nucleic acids Biochem.	2	1	0	3
BCH 729	General Biochemistry Methods.	0	0	6	2
BCH 731	Bioenergetics Principles	2	0	0	2
	Total				**18**

Second Semester:

Course Code	Course Title	L	T	P	U
BCH 720	Research Project	0	0	9	3
BCH 722	Introd. Enzymology & Enzymatic mtd	2	1	0	3
BCH 724	Endocrinology immunology	2	0	0	2
BCH 726	Immunology Immunochemistry.	2	1	0	3
BCH 728	Pharmacological Biochemistry	2	1	0	3
BCH 730	Blood and Tissue Chemistry	2	0	0	2
BCH 732	Seminar	2	0	0	2
	Total				**18**

Elective

Course Code	Course Title	L	T	P	U
BCH 712	Biochemical basis for Clinical Biochemistry	2	0	0	2

(ii) Applied Biochemistry Option:
First Semester

Course Code	Course Title	L	T	P	U
BCH 712	Biochemical basis for Clinical Biochemistry	2	0	0	2
BCH 721	Introd. To Carbon Biochem.	2	1	0	3
BCH 723	Metab. Of aminoacids & Proteins.	2	1	0	3
BCH 725	Lipid Biochemistry	2	0	0	2
BCH 727	Introd. To Nucleic acids Biochem.	2	1	0	3
BCH 729	General Biochemical Methods.	0	0	6	2
BCH 731	Bioenergetics Principles	0	0	0	2
	Total				**18**

(ii) Applied Biochemistry Option:
First Semester

Course Code	Course Title	L	T	P	U
BCH 712	Biochemical basis for Clinical Biochemistry	2	0	0	2
BCH 721	Introd. To Carbon Biochem.	2	1	0	3
BCH 723	Metab. Of aminoacids & Proteins.	2	1	0	3
BCH 725	Lipid Biochemistry	2	0	0	2
BCH 727	Introd. To Nucleic acids Biochem.	2	1	0	3
BCH 729	General Biochemical Methods.	0	0	6	2
BCH 731	Bioenergetics Principles	0	0	0	2
	Total				**18**

COURSE SYNOPSES

BCH 712 Biochemical basis for Clinical Biochemistry (1 unit)

Collection of specimens for clinical Biochemistry, Quality control, Use of control sera. Colorimetric analysis, Beer's law.

BCH 721 Introduction to Carbohydrate Biochemistry (3 units)

Monosaccharides: action of acids and bases on monosaccharides, disaccharides and polysaccharides. Identification and analysis of monosaccarides, disaccharides and oligosaccharides, polysaccharides, glycoprotein, Glycolysis.

BCH 722 Introduction to Enzymology and Enzymatic methods in Clinical Biochemistry (3 units)

Mechanism of enzyme catalysed reactions. Introduction to Enzyme kinetics. Classification and nomenclature of enzymes. Vitamins and co-enzyme, fat and water-soluble vitamins-structure and function. Principles of enzymatic methods of analysis. Glucose oxidase, SGOT, SGPT, Urase, Alkaline phosphatise, amylase, lactate dehydrogenase.

BCH 723 Metabolism of Amino acid and Proteins (3 units)

General importance of amino acid and proteins. Essential and non-essential amino acids. Protein degradation-proteolytic hydrolysis. Amino acid composition and sequence of proteins. Degradation of amino acid for energy and gluconeogenesis. Amino nacid transamination, decarboxylation, oxidative deamination. Glucogenic and ketogenic amino acids, urea cycle. Metabolism of one carbon compound. Biosynthesis of oligopeptides. Metabolic disorder. Regulation of amino acid metabolism.

BCH 724 Endocrinology (2 units)

Endocrine glands organization. Cellular communication by endocrine glands. Control of endocrine actions. Endocrine control of metabolism, water balance, reproduction, insulin action, thyroid hormones.

BCH 725 Lipid Biochemistry (2 units)

Classification of lipids- complex lipids, simple lipids. Saponifiable and non-saponifiable lipids. Fatty acid-essential and non-essential, characteristics, triglycerides, phosphoglycerides, sphingolipids, waxes. Terpenes and steroids, oxidation of fatty acids. Formation and significance of ketone bodies. An introduction to biological membranes.

BCH 726 Immunology & Immunochemistry (3 units)

Immunity non-specific defence mechanisms, Antigens acquired immunity (immune response). Antibody formation, immunoglobins. Role of thymus in immunity. Autoimmunity infection, immunity & protection, immunochemistry.

BCH 727 Introduction to Nucleic Acids Biochemistry (3 units)

Nomenclature of bases, nucleosides and nucleotides. Nucleic acids. Hydrolysis of nucleic acids. Analysis of nucleotide sequence in nucleic acids. Nucleic acid-protein complexes. Genetic role structure and replication of DNA.

BCH 728 Pharmacological Biochemistry (3 units)

Host-parasite relationships. Metabolic factors affecting chemotherapeutic agents. Mechanism of drug action. Factors affecting drug efficacy. Biochemical action of some selected drugs. Nigerian medicinal plants in the management and therapy of common ailments.

BCH 729 General Biochemistry Methods (2 units)

Laboratory course consisting of experiments in areas of interest of academic staff. The course will expose students to current biochemical equipments and methods of research. Course will also include preparation of dissertation or thesis.

BCH 730 Blood & Tissue Biochemistry (2 units)

Blood production (crythropoiesis), constituents of blood. Haemoglobin synthesis, the porphyrins etc. Blood electrolytes, acid-base balances HCO_3. The kidney; production urine, plasma proteins, albumin, globulin, fibrinogen. Methods of analysis of plasma proteins, electrophoresis.

BCH 731 Bioenergetic Principles (2 units)

A review of the laws of thermodynamics. Free energy and free energy change. Coupled reaction. Relationship between freee energy change and equilibrium constant. Exergonic and endergnic reactions. The standard free energy of the hydrolysis of ATP. Structural basis of the free energy change during hydrolysis of ATP. Oxidation-Reduction reactions. Electrode potentials and the pH electrode. Oxidative phosphorylation and the energy-coupling hypothesis. Active transport.

BCH 734 Biotechnology (3 units)

Coordination of microbial metabolism, media and air sterilisation, power requirements in fermentation vessels, instrumentation and control of fermentation processes, chemicals and fuels via fermentation, production of antibiotics, cellulose and starch hydrolysis.

BCH 736 Industrial Biochemistry (3 units)

Characteristics of industrial microorganisms; screening and strain improvement, metabolic pathways of industrial products, primary and secondary metabolites; over production of industrial fermentation processes; continuous fermentation methods. Production of industrial chemicals-alcohols, organic acids, amino acids, vitamins, antibiotics, SCP production. Enzyme production and application. Brewing-beer, wines, food fermentation, yeast fermentation, waste disposal, waste utilization.

BCH 738 Food Biochemistry (2 units)

An introduction to the determination of proximate constituent of food. Energy value of food and expenditure by mammalian, food processing, preservation and storage of traditional foods. Food poisoning, preventions and cure.

BCH 740 Enzymology (2 units)

Classification and nomenclature of enzymes. Characteristics of enzymes. Active site of enzymes. Kinetics of enzyme catalysed reactions. Effect of temperature, pH, ions, and substrate concentration on enzyme catalysed reactions. Michaelis-Menten constant, Km, maximum **v**elocity V_{max} and inhibitor constants K_i. Some clinical aspect of enzymology.

M.TECH APPLIED BIOCHEMISTRY

1.0 OBJECTIVES

The primary objective of the Postgraduate programme is to train graduates to have a broad-based knowledge of Biochemistry and also at the same time to develop specialized interests in specific areas of biochemical research with applications in industry and Agriculture. Such interests include; Enzyme and Fermentation Biotechnology, Toxicology, Microbial Biochemistry, Genetic Engineering and other areas of interest to the department.

Furthermore, the broad-based nature of the training is designed to make students aware of the increasing relevance of biochemistry in producing goods and services for the benefit of mankind so as to be able to:

1. Organize and supervise quality control in brewing pharmaceutical and allied industry.
2. Help industry to develop research into specialized areas of biotechnology, such as recombinant DNA technology for strain improvement in agriculture.

The M.Tech programme will be by course work and research and is geared to the needs and background of individual students. The design of the taught courses will allow non-biochemistry graduates to benefit from the M.Tech programme.

2.0 ADMISSION REQUIREMENTS

(a) M.Tech

Candidates seeking admission into the programme must possess any of the following:

(i) A bachelor's degree in Clinical/Applied Biochemistry with minimum of second class lower division degree.

(ii) A bachelor's degree in Microbiology, Food science and Technology, Chemistry, Pure Biochemistry, and other related discipline

(iii) HND/FINAL Diploma (AIST/AIMLT in Chemistry/ Biochemistry option and any other related option with a minimum pass at credit level with a postgraduate diploma (PGD) certificate.

In addition to the University's general regulations and guidelines on admission, graduates with at least Second Class Lower Division in the following related disciplines will be qualified for admission:

(i) Biochemistry, Biotechnology
(ii) Molecular Biology, Genetics
(iii) Applied Microbiology
(iv) Chemistry
(v) Animal Science, Physiology
(vi) Agriculture
(vii) Pharmacy

3.0 DEGREE REQUIREMENTS:

The M.Tech degree requirements include the following:

Course Requirement: Candidates must offer the core/ compulsory courses. 30 units of study are required for graduation in the Master's programme. Full time students shall not enrol for more than 18 units. Assessment of a candidate for an M.Tech will be in four parts:

(i) BCH 809: Advanced Laboratory Course: the performance in this course will be by continual assessment.

(ii) Written papers on courses: compulsory courses and electives will be assessed in written papers and in any other form the department considers useful.

(iii) Thesis: A thesis describing the original work carried out by each candidate. While studying for the degree shall be submitted according to University regulation.

(iv) Oral Examination: After submitting the dissertation the candidates will be examined orally by a board of Examiners constituted by the school.

4.0 DURATION OF PROGRAMME

The M.Tech programme will normally last between 18-24 months for full time.

COURSE OUTLINE

First Semester:

Course Code	Course Title	L	T	P	U
BCH 801	Intermediary Metabolism	3	-	-	3
BCH 803	Protein Structure & Function	3	-	-	3
BCH 805	Gene Regulation	2	-	-	2
BCH 807	Biomembrane Structure & Function	2	-	-	2
BCH 809	Biochemical Methods	1	-	6	3
	Elective	3	-	-	3
	Total				**16**

Elective

Course Code	Course Title	L	T	P	U
BCH 813	Food & Nutritional Biochemistry	3	-	-	3
BCH 815	Enzyme Technology	3	-	-	3
BCH 817	Phytomedicine & Medicinal Chemistry	3	-	-	3

Second Semester:

Course Code	Course Title	L	T	P	U
BCH 802	Advanced Process Biochemistry	3	-	-	3
BCH 804	Recombinant DNA Technology	2	-	-	2
BCH 806	Functional Biochemistry	3	-	-	3
BCH 808	Recent Advances in Biotechnology	3	-	-	3
BCH 810	Seminar and Independent Study	-	-	-	2
	Elective	3	-	-	3
	total				**16**

Electives

BCH 812	Biochemistry of Xenobiotics	3	-	-	3
BCH 814	Fermentation Technology	3	-	-	5
BCH 816	Advanced Microbial Biochemistry	3	-	-	3

COURSE SYNOPSES

BCH 801 Intermediary Metabolism 3 Units

Essential outlines of the metabolism of carbohydrates, lipids and proteins including the role of enzymes, coenzymes and vitamins. The tricarboxylic acid cycle, glycolysis, the phosphogluconate pathway. Aspects of abnormal metabolism of carbohydrates, fat and proteins including glycogen storage disease, ketosis and amino aciduria .Essential and non-essential amino acids, fatty acids. Nucleic acid metabolism-nature of gene, its replication, transcription and translation. The genetic code outline of protein synthesis.

BCH 802 Advanced Process Biochemistry 3 Units

A review of general metabolism pathway, control and application in industrial processes. Fermentation-alcoholic, amino acids, antibiotics and its and other secondary metabolites. Primary and secondary metabolism. Process evaluation and development. Over –production of metabolites-amino acids, taste enhancers, organism of industrial importance. Microbial production of beer, wine, bread and cheese. Microbiology production of pharmaceutics (hormones and interferon) and industrial chemicals.

Methanogenesis mechanism and application for waste treatment. Strain improvement strategies for industrial organism-induction of mutation in micro-organism and plants for the purpose of over production .Strain selection/ development and enhancement. Gene dosage and its application in industrial process.

BCH 803 Protein structure & function 3 Units

Exploration of the relationship between sequence, structure, biophysics and function. Rational design of protein structure, activity and stability. Current methods and application of protein engineering including protein evolution, unnatural amino acids and combinatorial methods.

BCH 804 Recombinant DNA Technology 2 Units

Introduction to Recombinant DNA Technology; Constructing gene libraries; Cloning vectors; Restriction Endonucleases; Gene Probes and Hybridization; Screening Gene libraries; Application of Gene Cloning; Expression of Foreign Genes; Analysing Gene and Gene Expression; Microarrays and DNA Chips; Analysing Whole Genomes.

BCH 805 Gene Regulation 2 Units

Discussion of experimental used to purify, analyse and manipulate nucleic acids, isolate molecular clones from complex genomes, physically map genomes, analyse gene expression and perform reverse genetics. Mechanism and regulation of transcription and translation in prokaryotic and eukaryotic organism.

BCH 806 Functional Biochemistry 3 Units

Biochemistry of blood; Blood components, Biochemical behaviour of Blood cells; Biochemical function of Blood and their characterization; Blood as source of medicinal preparation. Characterization of serum components in Norm and in pathology Biochemistry of the liver: Regulatory-homeostatic function, Ureapoietic function, Biligenic and Excretory functions Detoxifying function Disturbances of liver functions. Biochemistry of the kidney: Mechanism of Uropoiesis in various segments of Nephron; Regulatory-homeostatic function; Detoxifying function; Incretory function, characterization of urine components in Norm and in pathology.

BCH 807 Biomembrane Structure & Function 2 Units

Introduction to the structures and roles of lipids and their behaviour, liposomes, membrane proteins and kinetics, protein sorting and signal transduction. Lipid diversity, lipid aggregates, dynamics and phase behaviour of lipid aggregates, permeabilities of modern and cellular bilayers, manipulation and quantitation of ionic and PH gradients.

BCH 808 Recent Advance in Biotechnology 2 Units

Introduction to the concept of Biotechnology (traditional and modern); Fermentation technology; Monoclonal antibodies technology; Biosensors; Immobilization technology; Kinetic properties and Reactor design; Bioinformatics; Protein Engineering; Vaccination & Gene Manipulation; Genetically Modified Foods; Structural Biology & Rational Drug Design; Molecular Diagnosis in Inherited Disease.

BCH 809 Biochemical Methods 3 Units

This is a practical course covering a wide range of biochemical techniques, some of which are already in use in the department. It is aimed at improving the manipulative skill of the students and familiarizing the student with a variety of preparation and analytical techniques.

BCH 810 Seminar & Independent Study 2 Units

Each students will deliver seminars on selected topics and submits a written paper on a specific subject.

BCH 812 Biochemistry of Xenobiotics 3 Units

Absorption and distribution of xenobiotics; kinetics of xenobiotics; Theories of the mechanism of drug action; ligand-receptor interaction; Drug resistances and other factors affecting drug action. Metabolism of xenobiotics; Factors affecting metabolism of xenobiotics; Drug metabolites isolation and structural identification; Biochemical mode action of pesticides; Elimination of xenobiotics; Current topics in food, environmental and industrial toxicology.

BCH 813 Food & Nutritional Biochemistry 3 Units

Food analysis- proximate, mineral, antinutrient, vitamin and antioxidant activity determination. Food processing &preparation, food preservation, food storage, food poisoning, food intoxication, food hygiene, functional food, diet therapy, nutritional status and nutrient requirements. Nutritional disorders: prevention and therapy. Recommended dietary allowances. Assessment of nutritional status Nutrient requirements in relation to physical activity ageing, and disease.

BCH 814 Fermentation Technology 3 Units

Microbial growth; primary and secondary metabolism; concept of liquid substrate fermentation and solid substrate fermentation technology; The fermentation process-the mode of operation of fermentation processes, application of fermentation-microbial biomass, microbial enzymes, transformation process, recombinant products. The genetic improvement of products formation-mutation and recombination; Brewing technology.

BCH 815 Enzymes Technology 3 Units

Introduction to Enzymology, Commercial source of enzymes; Extraction and purification of enzymes; Medical and pharmaceutical application of enzymes; Immobilization of enzymes; Uses of enzymes in agriculture and the food industry; Enzymes-based sensors; Use of enzymes in organic solvent; Synthetic enzymes; Design of enzymes assays.

BCH 816 Advanced Microbial Biochemistry 3 Units

Molecular architecture of the bacteria cell; Bacterial growth ; Bacterial nutrition; micro- organism in the production of food; industrial chemicals; chemotherapeutical agents and enzymes; use of bioreactors; beneficial aspects of microorganism; immobilized enzymes and cells preparation and their application; control of microorganism and food processing; Virus; iysogeny and iysis; transduction, oncogenic virus.

BCH 817 Phytomedicine & Medicinal Chemistry 3 Units

Introduction to chemistry, pharmacology, botanical sources, safety and efficacy issues of commonly used herbal drugs with emphasis on medicinal chemistry. General principles of medicinal chemistry and pharmacology and comprehensive survey of anti- infective and antineoplastic drugs, including agents acting on the autonomic, cardiovascular, haematopoietic, inflammatory and gastrointestinal systems.

BCH 899 Master's Thesis Research Project 12 Units

Independent research findings into selected areas/topics of interest to the academic staff. Students will be required to carry out literature survey on the topics, perform experiments and produce theses. Student will be subjected to both seminar and oral examination on the projects undertaken.

Ph.D

This is designed to train manpower for tertiary institutions. This is programme by research for a period not less than 48 months. Eligibility includes Master of science or M.Tech. in any field of biochemistry scoring at least 60% or with a G.P.A. of 3.50. The Ph.D Degree programme is open to candidates holding an M.Tech, M.Sc. or M.Phil. preferably in Biochemistry. In special cases candidates qualified in a field very closely related to or overlapping areas of biochemistry (e.g. Microbiology, Clinical Biochemistry) will be accepted. In the latter cases the candidates might be required to take supplementary courses without credit.

BCH 999 Doctoral Research Project.

The programme is by research whereby the student will come up with research proposal in any area of biochemistry. The project has to be approved by the Departmental Postgraduate Advisory Committee, and supervised by at least two lecturers. The students will have to deliver three seminars on the proposal and the work, and write a good thesis examinable by appointed examiners.

DURATION OF PROGRAMME:

Ph.D Applied Biochemistry

A Candidates with a Masters Degree studying full-time can be awarded a Ph.D after a minimum of 36 months study. A part-time student can qualify for a Ph.D in a minimum of 48 months after a Masters Degree.

In all cases, the senate may extend as it deems fit and necessary. On application, candidates may be granted extension on the programmed duration subject to Senate's approval.

DEGREE REQUIREMENTS:

Ph.D Degree:

(1) The Ph.D Degree shall be assessed by research work. Course work shall be required by students who have been found deficient in relevant areas, and candidates shall after completing the course work be further required to pass a qualifying examination.

(2) A Ph.D Candidates will be expected to deliver regular seminars on current topics in biochemistry, and must submit a thesis according to University Regulations. He must also present a seminar on his research work.

(3) A candidate registered for the Ph.D in consultation with his supervisor submit to the Department at the end of the first session a comprehensive research proposal for assessment by a committee set up by the department. This must include a revise of the present knowledge of the field of research as well as the future, trends, and research methodologies.

(4) The candidates must at the end of the programme submit a thesis describing original work carried out while studying for the degree and written in the format specified by the postgraduate school.

A Board of Examiners according to University Regulation must thereafter examine the candidate orally. The candidates must also have presented a seminar on the completed thesis.

LIST OF ACADEMIC STAFF IN BIOCHEMISTRY DEPARTMENT (BCH)

S/N	NAME OF ACADEMIC STAFF	RANK	AREA OF SPECIALIZA-TION	QUALIFICATION
1.	Prof. D. M. Sanni	Professor	Enzyme & Food Biotechnology	B. Tech (Biochemistry), M. Tech. (Applied Biochemistry), Ph.D (Biochemistry)
2.	Prof. A. A. Akindahunsi	Professor	Nutritional Biochemistry and Toxicology	B.Sc.(Biochemistry), M.Sc.(Biochemistry), Ph.D. (Chemistry)
3.	Prof. J. O. Ajele	Professor	Enzymology	B.Sc. (Biochemistry), M.Sc. (Biochemistry) Ph.D (Biochemistry)
4.	Prof. (Mrs) M. T. Olaleye	Professor	Toxicology/Drug Metabolism	B. Tech, (Biochemistry), M. Tech. (Applied Biochemistry), Ph.D. (Biochemistry)
5.	Prof. G. Oboh	Professor	Food Biochemistry & Toxicology	B. Tech. (Biochemistry), M. Tech.(Applied Biochemistry) Ph.D (Biochemistry)
6.	Prof. E. O. Ibukun	Professor	Molecular Biology/Lipids Biochemistry	B.Sc., M.Sc (Biochemistry) Ph.D (Biochemistry)
7.	Prof. A. C. Akinmoladun	Professor	Phytomedicine Pharmacology and Toxicology	B.Sc, (Biochemistry, M.Sc. (Biochemistry). Ph.D (Biochemistry)
8.	Prof. I. J. Kade	Professor	Biochemical/ Toxicology	B. Tech. (Biochemistry), M.Tech.(Applied Biochemistry), Ph.D (Biochemistry)
9.	Prof. S. O. Salawu	Professor	Food Biochemistry and Toxicology	B. Tech, (Biochemistry) M.Tech. (Applied Biochemistry) Ph.D (Biochemistry)
10,	Prof. A. O. Kolawole	Professor	Enzymology & Biophysical Chemistry	B. Tech, (Biochemistry) M.Tech. (Biochemistry). Ph.D (Biochemisrty
11.	Prof. (Mrs) F. M. Olajuyigbe	Professor	Enzyme Biotechnology & Structural Biology	B. Sc. (Biochemistry), M.Tech. (Biochemistry) Ph.D (Biochemistry)
12.	Prof. A. O. Lawal	Professor	Molecular Biology/Toxicology	B.Sc (Biochemistry), M.Sc. (Biochemistry), Ph.D (Biochemistry)
13.	Prof. A. O. Ademiluyi	Professor	Food Biochemistry & Toxicology	B.Sc. (Biochemistry), M.Tech. (Biochemistry), Ph.D (Biochemistry)
14.	Prof. S. A. Adefegha	Professor	Food Biochemistry Toxicology &Molecular Nutrition	B.Sc. (Biochemistry), MSc. (Biochemistry) Ph.D (Biochemistry)
15.	Prof. (Mrs) B. C. Adedayo	Professor	Food Biochemistry & Toxicology	B.Tech,(Applied Biochemistry M. Sc. (Chemical Pathology), Ph.D (Applied Biochemistry)
16.	Dr. O. O. Elekofehinti	Reader	Molecular Biology/Toxicology and Bioinformatics	B.Sc (Biochemistry), M. Sc.(Biochemistry) Ph.D (Biochemistry)
17.	Dr. A. O. Ademosun	Reader	Food Biochemistry & Toxicology	B.Tech, (Biochemistry), M.Tech. (Biochemistry), Ph.D (Biochemistry)
19.	Dr. (Mrs.) E. E. Nwanna	Senior Lecturer	Food Biochemistry/ Nutrigenoinics	B.Tech. (Biochemistry) M.Tech. (Biochemistry), Ph.D (Biochemistry)
20.	Dr, O. S. Bamidele	Senior Lecturer	Enzymology and Protein Chemistry	B.Sc. (Biochemistry), M.Tech.(Biochemistry), Ph.D (Biochemistry).
21	Dr. (Mrs.) A. N. Kolawole	Senior Lecturer	Enzymology	B. Tech, (Biochemistry), Tech.(Biochemistry), Ph.D (Biochemistry).
22	Dr. O. M. Agunloye	Lecturer 1	Food Biochemistry and Nutraceuticals	B.Sc, (Biochemistry) M.Tech,(Biochemistry) Ph.D (Biochemistry)
23	Dr. (Mrs.) A. J. Awoniyi	Lecturer 1	Food and Nutritional Biochemistry/ Nutraceuticals Dev.	B.Sc.(Biochemistry), M.Sc.(Biochemistry), Ph.D (Biochemistry)

9.8.2 DEPARTMENT OF BIOLOGY

POSTGRADUATE PROGRAMME

A). POSTGRADUATE DIPLOMA (PGD) IN FOOD STORAGE TECHNOLOGY

AIMS AND OBJECTIVES OF THE PROGRAMME:

The programme is aimed at:

1. Producing high man power in the science through the acquisition of requisite skills and knowledge, for national development.
2. Developing in science graduates a sense of inquiry, capacity for independent research and motivation to extend the frontiers of science and technology.
3. Producing graduates who are capable of applying appropriate scientific principles for solving problems for the promotion of human well-being.
4. Producing manpower with optimal competencies and skills to function effectively in the academia and the private sector.
5. Serving as a refresher course for professional experts in food industries in updating their knowledge of food storage techniques.
6. Converting interested graduate of relevant biological and allied science in to food storage experts/scientists.

JUSTIFICATION FOR THE PGD PROGRAMME

Many practicing graduates of biological sciences in food related fields constantly find the need to acquire additional knowledge of food storage technology in the course of performing their duties. Also, practicing graduates of food storage technology and allied courses constantly find the need to update their knowledge of food storage technology and learn new techniques in food storage.Several products of polytechnics engaged in the practices of food storage are unable to update their knowledge to those of professionals. Most of these people in the categories described above are in full time bases. This group of people can only be helped by a part-time programme which is flexible enough to fit into their free, but unlimited period. This post-graduate diploma programme is therefore an ideal response to the requests of this group of people.

DURATION

The Programme is designed to last three consecutive semesters.

ADMISSION REQUIREMENTS

A prospective candidate for the programme should possess either:

(i) All candidates must have five credit passes including English, Mathematics, Physics, Chemistry and Biology/Agric. science at 'O'Level

(ii) A Bachelor's degree (Third class) in any Biological Science or related field from any recognized University

(iii) A Higher National Diploma (HND) or equivalent at upper credit level in Biological Science/Techniques from a recognized tertiary institution.

REQUIREMENTS FOR GRADUATION

A candidate is deemed to have satisfied the requirements for graduation after passing all the required courses listed. The required minimum load unit for graduation is 30 units.

COURSE OUTLINE

FIRST SEMESTER		UNITS
BIO 751	Warehouse Management Practice	2
BIO 753	Biostatistics	2
BIO 755	Food Biochemistry	3
BIO 757	Pest Control	2
BIO 759	Food Microbiology	2
BIO 761	Food Quality Control	1
BIO 763	Storage Engineering	2
BIO 765	Microbiological Methods in Storage Practice	2
	TOTAL	**16**

SECOND SEMESTER		UNITS
BIO 752	Economic Botany	2
BIO 754	Biological Techniques	2
BIO 756	Stored Products Entomology and Control	3
BIO 758	Industrial Visit/Field Trip	1
BIO 760	Food Preservation Technology	3
BIO 762	Food Processing	2
BIO 764	Parasitic Insects and Vector Biology	2
BIO 768	Seminar	2
	TOTAL	**17**

THIRD SEMESTER		UNITS
BIO 799	PGD Research Project	**6**

COURSE SYNOPSIS

		L T P U
BIO 751	**WAREHOUSE MANAGEMENT PRACTICE** General storage hygiene, Record keeping in a Warehouse. Maintenance of stored produce quality. Sampling techniques, controlled ventilation and stacking of containers. Development and monitoring of a product loading system.	1 0 3 2
BIO 752	**ECONOMIC BOTANY** Seed and seedless plants of Economic importance, Ethnobotany	2 0 0 2
BIO 753	**BIOSTATISTICS** Introductory statistical methods involving normal Distribution, central tendencies, such as mean, mode, median, chi-square analysis, Linear regression, analysis of variance e.t.c.	2 0 0 2
BIO 754	**BIOLOGICAL TECHNIQUES** Basic instrumentation an separation techniques used In quality control such as flame photometry, spectrophotometry, Chromatography centrifugation, electrophoresis, Radioisotopic techniques etc.	2 0 0 2
BIO 755	**FOOD BIOCHEMISTRY** Biological compounds such as carbohydrates, protein Lipids, vitamins, water and minerals, food enzymes digestion, Absorption, assimilation, control of food intake, hunger and appetite.	2 0 3 3
BIO 756	**STORED PRODUCTS ENTOMOLOGY AND CONTROL** Biology of insect pests of stored product such as grains and grain legumes, vegetables and fruits, tuber and root crops, timber, meat, leather, stored fish, wildlife products, e.t.c. Detailed study of their life cycles, identification of various Stages, behavioural and structural adaptations as well as their Control	2 0 3 3
BIO 757	**PEST CONTROL** This course shall deal with all methods available for the control of pests of stored products. The pests shall include insects, birds, microorganisms and rodents, pest control methods such as physical, mechanical, cultural, chemical, biological, microbial and integrated pest management techniques.	2 0 0 2
BIO 758	**INDUSTRIAL VISIT/FIELD TRIP** Excursion to industries, farm and establishments involved in food preservation and storage.	0 0 3 1
BIO 759	**FOOD MICROBIOLOGY** Environmental microbiology of food, effect of Microbes on food, food poisoning and control, food micro-biological standards. Disease of animals transmissible to Man via animal products.	1 0 3 2
BIO 760	**FOOD PRESERVATION TECHNOLOGY** Traditional and modern techniques for storage of diverse Agricultural products including both dry and wet foodstuffs. Techniques such as sun drying, salt curing, smoking, fermentation, Canning, freezing, chemical preservation and packaging techniques. Use of silos, hermetic storage techniques	2 0 3 3

	and inert atmospheres and Other post-harvest handling techniques.	
BIO 761	**FOOD QUALITY CONTROL** Scientific methods of analysis in food and beverages Industries including parameters appearance, moisture content Hagber falling number test, protein level and quality, sugars, Salt content, alkalinity, ash, minerals, preservatives, Contaminants, etc. statistical methods of quality control, Sampling plans and process control, microorganisms as agents of Quantitative analysis.	1 0 0 1
BIO762	**FOOD PROCESSING** This course deals with handling and storage of cereal crop, root and tuber crops, non-alcoholic beverages as well as animal products like fish, meat, poultry and dairy products. Use of radiations in food preservation. Insect contaminants and Methods of detecting contaminants in foods.	1 0 3 2
BIO 763	**STORAGE ENGINEERING** Grain processing and grinding equipment, grain cleaning and grading equipment. General principles of post-harvest handling of crops and grain storage structure. Equipment for crop drying processing and pesticides application. Food processing operation and design features of food processing equipment.	1 0 3 2
BIO 764	**PARASITIC INSECTS AND VECTOR BIOLOGY** The role of insects in pathogen transmission. The biology, Identification and control of human parasitic insects and vectors such as mosquitoes, black flies, tsetse flies, triatomid bugs, lice, bed bugs, Cyclops, fleas, rodents and molluscs.	2 0 0 2
BIO 765	**MICROBIOLOGICAL METHODS IN STORAGE PRACTICE** Determination of percentage mouldiness in stored dry foods such as cocoa beans, groundnut, cowpeas etc. Artificial culture and isolation of storage microbes using different types of media. Media preparation. Methods of detecting mycotoxins enzymes and other microbial metabolites in stored foodstuffs. Sterility tests. Inoculation and transfer techniques, Storage of microbial culture. Guide to identification of bacteria, yeasts and moulds on stored products. Microscopy techniques necessary for identification such as specimen preparation, staining, micrometry etc. Fungal spore and bacterial cell count techniques. Aseptic techniques, sterilization procedure.	1 0 3 2
BIO 768	**SEMINAR** The candidate is expected to carry out an original literature search on a broad topic on food storage and present a talk on the chosen topic. A written and bound term paper on the seminar to be submitted to the Department.	
BIO 799	**PGD RESEARCH PROJECT** A research project involving an investigation on a Food Storage problem. The report should be written in a form of a Scientific report or paper.	0 0 18 6

B). MASTER OF TECHNOLOGY (M. Tech)

PROGRAMMES MOUNTED

1). **MTech Food Storage Technology**
2). **M. Tech. Environmental Biology and Public Health.**
3). **M. Tech. Applied Parasitology.**
4). **M. Tech. Applied Entomology and Pests Management**

GENERAL COURSES

All postgraduate students (irrespective of the programme) must take Management and Entrepreneurship as well as ICT & Research Method as compulsory courses. However, any student who has taken them at a particular postgraduate level is exempted at higher levels.

SCI-801 Management and Entrepreneurship (2 Credit Units)

The course will cover business environment, general management, financial management, entrepreneurship development, feasibility studies, marketing and managerial problem solving.

SCI-802 ICT and Research Methodology (2 Credit Units)

This course should cover essential of Spreadsheets, Internet technology, Statistical Packages, Precision and Accuracy of Estimates, Principles of Scientific Research, Concepts of Hypotheses Formulation and Testing, Organization of Research and Report Writing.

SCI-804 Science, Environment and Innovation (2 Credit Units)

Elements of global warming, environmental protection issues, biodiversity, pollution, species at risk, social and ethical implications of science, enterprise and productivity, intellectual property rights, private public partnership and Investment.

1) MTECH FOOD STORAGE TECHNOLOGY

ADMISSION REQUIREMENTS:

In addition to the University's general regulations and guidelines on admission, graduates in the following related disciplines are qualified for admission into the Programme:

i. All candidates must have five credit passes including English, Mathematics, Physics, Chemistry and Biology/Agric. science at '0'Level.
ii. Candidates with Bachelor's degree in Biology, Botany, Zoology, Microbiology, and Storage Technology from an approved university must obtain a minimum of second-class lower division with a CGPA of 3.0/.5.0.
iii. Candidates with at least a third-class degree or HND (Distinction) and University PGD with a CGPA of 3.0/.5.0 or a minimum overall score of 60%; may be considered for admission.
iv. All candidates must demonstrate adequate intellectual capacity, maturity and effective decision and problem-solving potentials.
v. Other general requirements as prescribed by the Board of the School of Postgraduate Studies.

DEGREE REQUIREMENTS:

i) The programme which will normally last a minimum of 18 months full time and, will be by course work and research.

ii) A thesis describing the original work carried out by each candidate while studying for the degree shall be submitted according to University Regulation.

iii) After the submission of a dissertation, the candidate will be examined orally by

a Board of Examiners constituted by the School of Postgraduate Studies.

iv) Candidates must offer and maintain a minimum of a 'B 'average {50 – 69} in the score/compulsory courses. A minimum total of 30 units of study are required for graduation, excluding the research project.

PROGRAMME DURATION

The duration of the M. Tech. programme shall be as follows:

Full-Time – a minimum of 18 months and a maximum of 24 months.

REQUIREMENTS FOR GRADUATION

To be eligible for the award of M. Tech degree, a candidate must have:

(i) passed all the courses recommended by the Department,

(ii) successfully presented at least two seminars, proposal and final seminars,
(iii) fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University, and
(iv) Successfully completed and defended a research thesis in an oral examination.

OBJECTIVES

1 To produce high man power in the science through the acquisition of requisite skills and knowledge, for national development.
2 To develop in science graduates a sense of inquiry, capacity for independent research and motivation to extend the frontiers of science and technology.
3 To produce graduates who are capable of applying appropriate scientific principles for solving problems for the promotion of human well-being.
4 To produce manpower with optimal competencies and skills to function effectively in the academia and the private sector

To train highly skilled manpower in the area of preservation and storage of foods of plants and animal origin.

COURSE OUTLINE

FIRST SEMESTER		**L T P U**
BIO 801	Advanced Applied Storage Techniques	2 0 3 3
BIO 803	Principles of Storage Technology	2 0 3 3
BIO 805	Stored Products Entomology and vertebrate Pests	2 0 3 3
BIO 811	Storage Engineering	1 0 3 2
BIO 813	Statistical Methods and Experimental Design	3 0 0 3
SCI 801	Management and Entrepreneurship	1 0 0 2
	TOTAL	**16**
Elective		
BIO 807	Advanced Food Processing	2 0 3 3

SECOND SEMESTER		
BIO 802	Advanced Food and Storage Chemistry	0 3 3
BIO 804	Research Techniques in Storage Entomology & Microbiology	0 3 2
BIO 806	Posts Harvest handling of Perishable Crop	0 3 3
BIO 808	Bio-deterioration & Biodegradation	0 3 2
BIO 814	Seminar	0 3 2
BIO 816	Insect Pest Management	0 3 3
SCI 802	ICT and Research Methodology	0 0 2
	TOTAL	**7**
Electives		
BIO 812	Quality Control & Industrial Practices	1 0 3 2
CHE 806	Advanced Food Analysis	2 0 3 3

THIRD SEMESTER		
BIO 899	Master's Thesis Research Project	1 0 36 12

COURSE SYNOPSIS **L T P U**		
BIO 801	**ADVANCED STORAGE TECHNIQUES** Various techniques (traditional and modern) used for storage of diverse agricultural products with particular emphasis on durables and perishables. Principles and methods of preservation of foods, fish, wildlife products and crops, Emphasis on the understanding of agents of deterioration during storage - microorganisms, insects, rodents, birds etc. Control of agents of deterioration on stored products, Principles and methods of drying, Storage structures and mechanisms. Insecticides. Techniques of pest control, hazards of pesticides and safety	2 0 3 3

	precaution. Quality of stored products. Preservation and handling of perishables. To include laboratory work, field and industrial visits to explain the theory of Storage Techniques aimed at familiarising the student with a variety of techniques used for food preservation and storage.	
BIO 802	**ADVANCED FOOD AND STORAGE CHEMISTRY** Review of the basic techniques in Proximate Analysis of food e.g. lipid content analysis. Quality control tests in stored foods e.g. floatation, staining tests, objective and subjects tests. Organoleptic properties of foods. Food enzymes and factors affecting enzyme action. The Physiology and Chemistry of seed dormancy and sprouting in tubers.	2 0 3 3
BIO 803	**PRINCIPLES OF STORAGE TECHNOLOGY** Importance of storage, storage losses (types and detail assessments). Factors affecting storage, relative, humidity, moisture content, temperature their measurements and relationship. Detailed studies of measuring equipment. Relationship between climate and food. Inspection methods in details. Equipment and machinery for sampling and inspection. Factor considered in quality assessment. Loss assessment methodology. Good storage practices. Legislation, grading and quality standards in storage practices. Principles and methods of packaging in general and with special reference to	2 0 3 3
	Nigeria.	
BIO 804	**RESEARCH TECHNIQUES IN STORAGE ENTOMOLOGY AND MICROBIOLOGY** Insect culture, warehouse management, fumigants and fumigation techniques, insecticide applications to include knapsack sprayers, motorized sprayers, aerial spraying. Biological control of insect pests using laboratory and store models. Artificial culture and isolation of storage microbes using different types of media. Media preparation. Methods of detecting mycotoxins enzymes and other microbial metabolites in stored foodstuffs. Sterility tests. Inoculation and transfer techniques, Storage of microbial culture. Guide to identification of bacteria, yeasts and moulds on stored products. Microscopy techniques necessary for identification such as specimen preparation, staining, micrometry etc. Fungal spore and bacterial cell count techniques. Aseptic techniques, sterilization procedure.	2 0 3 3
BIO 805	**STORED PRODUCTS ENTOMOLOGY & VERTEBRATE PESTS** Biology, Ecology and Control of insect and vertebrate pests of stored products. Morphology of insects, rodents & birds involving a description of the various external features and its importance for survival in a storage environment. Behavioural and physiological characteristics of each group. The mode of action and metabolism of pesticides in	2 0 3 3

	the control of pests.	
BIO 806	**POST-HARVEST HANDING OF PERISHABLE CROPS** Perishables such as roots and tubers, fruits, vegetables, physiology of perishables in storage, causes and solutions. Harvesting, handling, processing methods, packaging, distribution, marketing and consumption of perishable crops.	2 0 3 3
BIO 807	**ADVANCED FOOD PROCESSING** Techniques of processing and preservation of Nigerian foods with regard, to their physiochemical properties. Methods of detecting contaminants of foods. Insect contaminants as spoilage organisms. Principles and practices of food processing. Canning containers, outline of canning operation, principal spoilage micro organisms in canned foods. Use of radiations in food preservation. Laboratory examination of canned foods.	2 0 3 3
BIO 808	**BIODETERIORATION AND BIODEGRADATION** Types of deterioration and spoilage materials, physical and chemical properties of such materials and how they are affected by activities of biodeteriogenic organisms. Measures of counter biodeteriogenic processing and their economic consequences.	1 0 3 2
BIO 811	**STORAGE ENGINNERING** Engineering and Agricultural processing equipment for primary processing of Agricultural products e.g., shellers, threshers etc. Crop drying and dryers. Engineering aspects of drying and crop machinery equipment for cleaning and grading of agricultural products. Storage structures, techniques and instrumentation. Power for storage machinery. Conveyors and grain handling equipment. Principles of drying, storage and food processing. Cold storage technology e.g., refrigeration, chilling, Deep freezing etc. pest control procedure, pesticides and various equipment for applying pesticides.	1 0 3 2
BIO 813	**STATISTICAL METHODS AND EXPERIMENTAL DESIGN** Simple techniques in experimental designs such as random sampling etc. Statistical methods involving central tendencies such as mean, median, mode etc, normal distribution, regression, chi-square; mean separation, Multiple Range Tests, Turkey's test, T-test etc. Design CRD, Randomized complete Block Design RCBD, Split-plot design etc.	3 0 0 3
BIO 814	**EMINARS** The Seminar will be on a research interest, which will be of high quality and in line with the area of research of the candidates. A written report will be submitted by the students	0 0 6 2
BIO816	**INSECT PEST MANAGEMENT** Strategies and all control methods for stored products pests including physical, mechanical, cultural, chemicals, biological, microbial, biotechnical and integrated	2 0 3 3

	techniques. Integrated management in tropical storage environment. Mode of action and metabolism of pesticides used in the control of pests.	
BIO899	**MASTER'S THESIS RESEARCH PROJECT** A research project involving an investigation on a food storage problem. The report should be written in a form of a scientific report or paper.	0 0 3 12

2) M. TECH. ENVIRONMENTAL BIOLOGY AND PUBLIC HEALTH

PHILOSOPHY

There is always an interaction between man and his environment (surrounding). Man has been able to modify the environment through various means including pollution, deforestation, indiscriminate disposal of sewage, refuse, agricultural wastes and industrial wastes. These activities result in the release of poisonous substances into the environment thus bringing about an imbalance in their natural composition, as well as provide breeding sites for vectors of parasitic infections. Consequently, the environment is increasingly becoming unfit for life and the survival of living organisms including humans. Some of these substances are biodegradable while others are non-biodegradable and thus persist in the environment. There is a lot of awareness about depletion of the ozone layer and the global climate change (global warming). The nature and sources of infections and routes of their transmission in the community will be studied in these programmes. Also, agents of biodegradation will be studied.

JUSTIFICATION FOR THE PROGRAMMES

The principal goal of the M. Tech. programmes is to contribute to the capacity building of tertiary institutions by producing graduates for teaching and research in Environmental Biology and Public Health, and Applied Parasitology. The programmes are designed to equip graduates having backgrounds in the different sub-disciplines of Biology with the advanced skills and knowledge required for successful management of the environment and prevention of parasitic infections/infestations, the bane of man's health and that of his livestock. Graduates of the programmes are expected to work proficiently in environmental, health and government agencies. Career opportunities for graduates of these programmes exist mainly in the environmental protection and health sectors including agencies concerned with disease prevention and control, environmental protection and impact assessment. Employment opportunities also exist in both public and private establishments concerned with Epidemiology, prevention and control of parasites of medical and veterinary importance, waste management and pollution control.

OBJECTIVES

To produce high man power in the science through the acquisition of requisite skills and knowledge, for national development.

To develop in science graduates a sense of inquiry, capacity for independent research and motivation to extend the frontiers of science and technology.

To produce graduates who are capable of applying appropriate scientific principles for solving problems for the promotion of human well-being.

To produce manpower with optimal competencies and skills to function effectively in the academia and the private sector

To train highly skilled manpower in the area of environmental biology and public health.

To expose graduates of this programme to ways of maintaining the environment and preventing parasitic infections/infestations for the overall improvement of the health of man and his livestock.

ADMISSION REQUIREMENTS: M. TECH. ENVIRONMENTAL BIOLOGY AND PUBLIC HEALTH

In addition to the University's general regulations and guidelines on admission, graduates in the following related disciplines are qualified for admission into the Programme:

i. All candidates must have five credit passes including English, Mathematics, Physics, Chemistry and Biology/Agric. science at '0'Level
ii. Candidates with Bachelor's degree in Biology, Zoology, Microbiology, Environmental Biology, Physiology from an approved university must obtain a minimum of second-class lower division with a CGPA of 3.0/.5.0.
iii. Candidates with a first degree in Medicine and Surgery may also be considered.
iv. All candidates must demonstrate adequate intellectual capacity, maturity and effective decision and problem-solving potentials.
v. Other general requirements as prescribed by the Board of the School of Postgraduate Studies.

DEGREE REQUIREMENTS:

i) The programme which will normally last a minimum of 18 months full time and, will be by course work and research.
ii) A thesis describing the original work carried out by each candidate while studying for the degree shall be submitted according to University Regulation.
iii) After the submission of a dissertation, the candidate will be examined orally by a Board of Examiners constituted by the School of Postgraduate Studies.
iv) Candidates must offer and maintain a minimum of a 'B 'average {50 – 69} in the score/compulsory courses. A minimum total of 30 units of study are required for graduation, excluding the research project.

PROGRAMME DURATION

The duration of the M. Tech. programme shall be as follows:

Full-Time – a minimum of 18 months and a maximum of 24 months.

REQUIREMENTS FOR GRADUATION

To be eligible for the award of M. Tech degree, a candidate must have:

(i) passed all the courses recommended by the Department
(ii) successfully presented at least two seminars, proposal and final seminars,
(iii) fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University, and
(iv) Successfully completed and defended a research thesis in an oral examination.

COURSE OUTLINE

FIRST SEMESTER		**L**	**T**	**P**	**U**
BIO 813	**Statistical Methods and Experimental Design**	**2**	**0**	**3**	**3**
BIO 821	**Communicable Diseases and Vector Biology**	**2**	**0**	**3**	**3**
BIO 823	**Public Health and Sanitary Practices**	**2**	**0**	**3**	**3**
BIO 825	**Environmental Impact Assessment**	**2**	**0**	**3**	**3**
BIO 827	**Ecology of Tropical Ecosystems**	**2**	**0**	**3**	**3**
BIO 829	**Behavioural Ecology**	**2**	**0**	**3**	**3**
SCI 801	**Management and Entrepreneurship**	**1**	**0**	**0**	**2**
		Total		**20 units**	
ELECTIVES					
BIO 831	**Modern Ethnobotany**	**1**	**0**	**3**	**2**
CHE 821	**Environmental Chemistry**	**2**	**0**	**3**	**3**

SECOND SEMESTER		**L**	**T**	**P**	**U**
BIO 822	**Research Methodology in Environmental Biology and Public Health**	**1**	**0**	**3**	**2**
BIO 824	**Global Change Biology**	**2**	**0**	**3**	**3**

BIO 826	**Biodiversity and Conservation**	**1**	**0**	**3**	**3**
BIO 828	**Biodegradation**	**2**	**0**	**3**	**3**
BIO 830	**Ecotoxicology**	**2**	**0**	**3**	**3**
BIO 814	**Seminar**	**0**	**0**	**6**	**2**
SCI 802	**ICT and Research Methodology**	**1**	**0**	**0**	**2**
				Total	**18 units**

ELECTIVES

BIO 834	**Medical and Forensic Entomology**	**2**	**0**	**3**	**3**
MET 814	**Environmental Pollution and Controls**	**2**	**0**	**3**	**3**

THIRD SEMESTER		**L**	**T**	**P**	**U**
BIO 899	**Masters' Thesis Research Project**	**0**	**0**	**36**	**12**

COURSE SYNOPSIS

BIO 813 STATISTICAL METHODS AND EXPERIMENTAL DESIGN (2 units)

Simple techniques in experimental design, such as random sampling, statistical methods involving central tendencies, such as mean, median, mode etc., normal distribution, regression, chi-square, mean separation, - multiple range test (Tukey test) t-test etc. CRD, RCBD, (Randomized complete Block Design), Split – plot design etc.

BIO 814 SEMINAR (2 units)

The seminar will centre on recent advances in the different aspects of environmental biology and public health, or applied parasitology. Seminar topics may not be directly related to the area of research of the candidate.

BIO 821 COMMUNICABLE DISEASES AND VECTOR BIOLOGY (3 units)

Aetiology of diseases; Epidemiology; Pathology, and Biology of selected parasites, Control of Tropical diseases, and their vectors in tropical Africa. Zoonosis, nosocomial infection, medical statistics.

BIO 822 RESEARCH METHODOLOGY IN ENVIRONMENTAL BIOLOGY & PUBLIC HEALTH (2 units)

Collection and preservation of parasites and their vectors; sampling and identification methods in field surveys; care of laboratory/experimental animals; diagnostic methods in laboratory investigations; data presentation and interpretation. Chromatography, Centrifugation, isolation & identification of microorganisms; specimen preparation.

BIO 823 PUBLIC HEALTH & SANITARY PRACTICES (3 units)

Sources of infections and routes of transmission in the community,

Epidemiology of Diseases, Community Health, hygiene and water sewage sanitation. Safe waste disposal practices. Hygiene and literacy. Community education and participation. Community diseases control and management; vector control, prophylaxis, vaccination and chemotherapy, inspection in food and dairy industries and general sanitary environment.

BIO 824 GLOBAL CHANGE BIOLOGY (3 units)

Climate change, Climate variability, Global warming - meaning Evidences of global environmental changes. Effect of climate change. Ozone depletion – causes and effects. Impact of desertification and deforestation.Climate change detection and attribution. Future climate: Future emissions and climate change. Climate predictions, study of climate sensitivity using simplified climate models. Biodiversity loss, bio-indicators, related treaties and conventions.

BIO 825 ENVIRONMENTAL IMPACT ASSESSMENT (3 units)

Basic concepts, principles and history of Environmental Impact Assessment (EIA). Relationship between EIA and Environmental Impact Statement (EIS). Indicator species and organisms of value in environmental assessment.

Essentials in EIA. Potential problems of EIA and their solutions. Cost benefits as a tool for environmental decision-making. History, Purposes and Economic implications of Environmental modifications e.g. Agriculture, Deforestation/Afforestation, Water conservation etc. Potential problems of Environmental modifications and their solutions. Human activities and natural occurrences that results in the modification of the environment. Field case studies of impact assessment in Nigeria.

BIO 826 BIODIVERSITY AND CONSERVATION (2 units)

Biodiversity, meaning and scope; principles of conservation biology/sustainable use of biological resources; bio-conservation methods; Critical studies in Nigerian biodiversity, conservation policies (local and global); National and International institutions associated with conservation; biodiversity conservation legislations, risk assessment in conservation biology; Global environmental changes and biodiversity.

BIO 827 ECOLOGY OF TROPICAL ECOSYSTEMS (3 units)

Intensive studies of the factors affecting the abundance and distribution of animals in tropical terrestrial ecosystem (lowland forests, savannah, deserts and montane system). Community structure, function and dynamics. Adaptation of animals to different tropical environments and effect of human activities on tropical ecosystems. Ecology of costal and tropical inland water like estuaries, lagoons, rivers, natural and artificial lakes. The inter-relationships of fauna and flora. Man's influence on the aquatic environment. Definition of wetlands, important terms associated with wetland in Nigeria. Ecology of wetlands. Biology of wetland fauna. Values of wetlands. Field studies.

BIO 828 BIODEGRADATION (3 units)

Survey of the agents of biodegradation – microorganisms, insects, mammals, annelids etc. The mechanisms of biodegradation – mechanical, enzymatic on materials such as xenobiotics, chemicals, petrochemicals, methane (natural gas), radio nuclides, computer diskettes, biological wastes. Sewage and industrial wastewater microbiology, biological weathering, biogeochemical cycles– nitrogen, sulphur, iron. Biogeochemistry of mercury. Environmental impact of biodegration, bioremediation.

BIO 829 BEHAVIOURAL ECOLOGY (3 units)

Advanced studies of the adaptive value of social organization, territory, reproductive ecology, feeding ecology, predator/prey interactions and competition. Case studies.

BIO 830 ECOTOXICOLOGY (3 units)

Historical review of human impact on the environment; major pollutant – sulphur dioxide, nitrogen oxide and nitrate, sewage, agricultural wastes, warfare, pesticides; toxic effects of chemical pollutants on populations, communities, and terrestrial, freshwater and marine ecosystems; mechanisms and processes whereby chemicals exert their effects on ecosystem and impact caused at population and community levels; Some specific examples of environmental toxins e.g. DDT and its environmental impact, organophosphorous pesticides, nitrates and algal bloom etc; methods of environmental monitoring; fate, assessment and behaviour of chemicals in the environment. Determination of physico-chemical parameters in terrestrial and aquatic environments. Sources of exposure to toxins. Natural and man-made toxins. Toxins in the Nigerian environment. Bioassay for ecotoxins. Resistance and evaluation of toxicity. Radiation biology

BIO 831 MODERN ETHNOBOTANY (2 units)

History of ethnobotanical studies (from economic botany to ethnobotany); modern approaches to ethnobotanical studies; collecting and identification of plants; ethnobotany conservation and community health care, plants of ethnobotanical importance in Nigeria.

BIO 833 MEDICAL & FORENSIC ENTOMOLOGY (3 units)

Biology, ecology and control of insect pests of medical and veterinary importance. Insects/arthropods involved in forensic entomology, - flies, beetles, mites, moths, warps, etc. Stages of decomposition of a body, Post Mortem Intervals (PMI) and its calculations; modern techniques in forensic entomology e.g. scanning electron microscopy, potassium permaryanate, etc.

BIO 899 MASTERS THESIS RESEARCH PROJECT (12 units)

A research project involving original and well researched investigations on topics related to environment and public health problem. The report should be written in the form of a scientific report or paper.

3) M.TECH. APPLIED PARASITOLOGY

ADMISSION REQUIREMENTS: M.TECH. APPLIED PARASITOLOGY

In addition to the University's general regulations and guidelines on admission, graduates in the following related disciplines are qualified for admission into the Programme:

i. All candidates must have five credit passes including English, Mathematics, Physics, Chemistry and Biology/Agric. science at '0'Level.
ii. Candidates with Bachelor's degree in Biology, Zoology, Microbiology, from an approved university must obtain a minimum of second-class lower division with a CGPA of 3.0/.5.0.
iii. Candidates with at least a third-class degree or HND (Distinction) and University PGD with a CGPA of 3.0/.5.0 or a minimum overall score of 60%; may be considered for admission.
vi. All candidates must demonstrate adequate intellectual capacity, maturity and effective decision and problem-solving potentials.
vii. Other general requirements as prescribed by the Board of the School of Postgraduate Studies.

DEGREE REQUIREMENTS:

i) The programme which will normally last a minimum of 18 months full time and, will be by course work and research.
ii) A thesis describing the original work carried out by each candidate while studying for the degree shall be submitted according to University Regulation.
iii) After the submission of a dissertation, the candidate will be examined orally by a Board of Examiners constituted by the School of Postgraduate Studies.
iv) Candidates must offer and maintain a minimum of a 'B 'average {50 – 69} in the score/compulsory courses. A minimum total of 30 units of study are required for graduation, excluding the research project.

PROGRAMME DURATION

The duration of the M. Tech. programme shall be as follows:

Full-Time – a minimum of 18 months and a maximum of 24 months.

REQUIREMENTS FOR GRADUATION

To be eligible for the award of M. Tech degree, a candidate must have:

(i) passed all the courses recommended by the Department,
(ii) successfully presented at least two seminars, proposal and final seminars,
(iii) fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University, and
(iv) Successfully completed and defended a research thesis in an oral examination

COURSE OUTLINE

FIRST SEMESTER		**L**	**T**	**P**	**U**
BIO 813	Statistical Methods and Experimental Design	2	0	3	3
BIO 841	Basic Principles and Concepts in Parasitology	2	0	3	3
BIO 843	Research Techniques in Applied Parasitology	1	0	3	2
BIO 845	Taxonomy of Parasites of Medical and Veterinary Importance	1	0	3	2
BIO 847	Transmission and disease of Protozoan Parasites	2	0	3	3
BIO 849	The Biology of Vectors of Parasitic Diseases	1	0	3	2
SCI 801	Management and Entrepreneurship	1	0	0	2
Total		**17 units**			

ELECTIVES

BIO 821	Communicable Diseases and Vector Biology	2	0	3	3
BIO 823	Public Health and Sanitary Practices	2	0	3	3

SECOND SEMESTER		L	T	P	U
BIO 814	Seminar	0	0	6	2
BIO 842	Transmission and Diseases of Helminth Parasites	2	0	3	3
BIO 844	Physiology and Biochemistry of Parasites	2	0	3	3
BIO 846	Parasite Immunology	2	0	3	3
BIO 848	Epidemiology and Control of Parasitic Disease in the Tropics	2	0	0	3
SCI 802	ICT and Research Methodology	1	0	0	2
Total	**14 units**				

ELECTIVE

BIO 852	Macromolecular Structures and Functions	2	0	3	3

THIRD SEMESTER		L	T	P	U
BIO 899	Master's Thesis Research Project	0	0	36	12

COURSE SYNOPSIS

BIO 813

STATISTICAL METHODS AND EXPERIMENTAL DESIGN (2 units)

Simple techniques in experimental design, such as random sampling, statistical methods involving central tendencies, such as mean, median, mode etc., normal distribution, regression, chi-square, mean separation, - multiple range test (Tukey test) t-test etc. CRD, RCBD, (Randomized complete Block Design), Split – plot design etc.

BIO 814

SEMINAR (2 units)

The seminar will centre on recent advances in the different aspects of environmental biology and public health, or applied parasitology. Seminar topics may not be directly related to the area of research of the candidate.

BIO 841

BASIC PRINCIPLES AND CONCEPTS IN PARASITOLOGY (3 units)

Hetero-specific associations among animals. Types of parasitism, parasite and their hosts. The effect of parasitism on the parasitism on the parasite and the host. Distribution of parasites in a host population. Factors influencing parasite density and distribution. Host-parasite specificity; the species problem and evolution of parasitism in the animal kingdom.

BIO 842

TRANSMISSION AND DISEASES OF HELMINTH PARASITES (3 Units)

Helminth parasites of medical and veterinary importance, including life history of parasites. Food and vector borne parasitic infections. Types of diseases caused by helminth parasites. The role of vector and host behaviour in parasitic helminth transmission. Circadian rhythms in the transmission of helminth parasites (filarial periodicity). The transmission of zoonotic infections Control strategies.

BIO 843

RESEARCH TECHNIQUES IN APPLIED PARASITOLOGY (2 units)

Collection and preservation of parasites and their vectors; identification; sampling methods in field and laboratory investigations. Egg counts in faecal samples; histochemical and biochemical techniques. The principles and uses of Sodium

Dodecysulphate polyacrylamide gel electrophoresis (SDS-PAGE), Polymerase chain reaction (PCR), Northern blotting and Western blotting.

BIO 844

PHYSIOLOGY AND BIOCHEMISTRY OF PARASITES (3 units)

Habitat and physicochemical requirements, nutrition, absorption, energy stores, energy metabolism in parasitic protozoa and helminths. Purines and pyrimidine biosynthesis, amino acid metabolism and membrane biology in parasitic protozoa and helminths. Moulting, arrested development, self-cure phenomena. Nutritional requirements of protozoan and helminth parasites particularly cysting and non-cysting sporozoans, flagellates, platyhelminths, nematodes and cestodes. Sub cellular organization of

metabolic pathways. Parasitic adaptations and propagation of parasites. Ultra-structure of parasites and its relationship to physiological processes

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BIO 845

TAXONOMY OF PARASITES OF MEDICAL AND VETERINARY IMPORTANCE (2 units)

Taxonomy of parasites, rules and system of naming and classifying parasites in general. Principles of the taxonomy of protozoan, platyhelminth, nematode and arthropod parasites. Problems of the taxonomy of parasites in tropical Africa.

BIO 846

PARASITE IMMUNOLOGY (3units)

Basic concepts; natural and acquired immunity. Cell types in immune systems; immunity to parasites (Protozoa and Helminths). Evasion of host immune response; advances in immunization against parasitic infections. Immunological methods.

BIO 847

TRANSMISSION AND DISEASES OF PROTOZOAN PARASITES 88K (3 units)

Parasitic Protozoa of medical and veterinary importance. Transmission patterns and types of diseases caused by protozoan parasites in the tropics. The role of vectors in the transmission of protozoan diseases. The role of host behaviour in the transmission of protozoan parasites.

BIO 848

EPIDEMIOLOGY AND CONTROL OF PARASITIC DISEASES IN THE TROPICS (3units)

Introduction to the principles and methods of epidemiology. Types of epidemiological surveys (Descriptive, experimental and analytical). Patterns of disease occurrence in the tropics. Measurement of parasitic infection in a host population. Epidemiology and recent developments in the control of major parasitic diseases and their vectors in tropical Africa. Ethical consideration in epidemiological studies.

BIO 849

THE BIOLOGY OF VECTORS OF PARASITIC DISEASES (2 units)

Types of insect and snail vectors of parasites. The habitats, habits, life cycle and behaviour of vectors in the transmission and control of diseases. Chemical, biological and ecological control of vectors. The economic importance of insect and snail vectors.

BIO 852

MACROMOLECULAR STRUCTURES AND FUNCTIONS (3 units)

DNA: biosynthesis is of precursors; enzymology, mechanism of replication; modification and restriction. Regulation of RNA synthesis; Repressors. Ribosome structure and function. Protein synthesis and structure in relation to function.

BIO 899

MASTERS THESIS RESEARCH PROJECT (12 units)

A research project involving original and well researched investigations on topics related to parasitology. The report should be written in the form of a scientific report or paper.

4. APPLIED ENTOMOLOGY AND PEST MANAGEMENT.

1.0 NAME OF PROGRAMME

Master of Technology in Biology (M. Tech. Biology) Applied Entomology and Pest Management.

2.0 PROGRAMME PHILOSOPHY

The Master of Technology in Biology (Applied Entomology and Pest Management) is designed to train and encourage scientists in Applied Biology with critical, analytical, independent and original thinking ability capable of solving state and national problems especially Entomology and management of pests of medical, veterinary, agricultural and forensic importance.

3.0 PROGRAMME OBJECTIVES

The objectives of the programme are to:

i. train highly skilled manpower that will help to minimize losses of agricultural products (in field and store) due to insect and other pests.
ii. equip graduates with background in any area of Biology with advanced skills and knowledge required to manage insects and other vectors of human and veterinary diseases.
iii. train skilled scientists in Biology specially equipped with advanced critical, analytical,

independent and original thinking ability, capable of solving state and national problems especially in the areas of Agriculture as well as Medical, Forensic and Veterinary Sciences.

iv. expose postgraduate students of this programme to rewarding careers in public and private sectors including health, agriculture, educational institutions, storage ventures and as consultants.

4.0 PROGRAMME JUSTIFICATION

The importance of insects, other arthropods and mammals in the socio-economic development of the nation cannot be overemphasized. These organisms, if not properly managed, could lead to economic loss and serious damage to agricultural resources, including crops and livestock and also affect human health.

Fundamentally, Department of Biology in The Federal University of Technology, Akure was established to apply the knowledge of Biology to solving problem of pests in Agriculture hence the award of B. Tech in Storage Technology since inception. M. Tech in Food Storage Technology covers Storage Entomology, Storage Microbiology and Postharvest Biology. Studies on application of the knowledge of these three key areas in Integrated Pest Management to solve problem of pests is extremely vital. It is therefore very important to train Biologists and Agriculturists in the area of Applied Entomology and Pest Management.

5.0 ADMISSION REQUIREMENTS

In addition to the University's general regulations and guidelines on admissions, the following are admission requirements for the programme:

i. Candidates with Bachelor's degree in Biology, Botany, Zoology, Microbiology and Storage Technology or other related fields, from an approved University with a minimum of Second Class Honours (Lower Division).
ii. Candidates with at least a third-class degree and PGD (upper credit) or HND of at least lower credit level and PGD (upper credit) in the appropriate discipline may be considered for admission.
iii. Other general requirements as prescribed by the Board of the School of Postgraduate Studies.

6.0 PROGRAMME DURATION

The duration of the M. Tech programme shall be as follows: Full time – a minimum of 18 months and a maximum of 24 months.

7.0 REQUIREMENTS FOR GRADUATION

To be eligible for the award of M.Tech Biology (Applied Entomology and Pest Management), a candidate must have:

i. passed all the courses recommended by the Department and accumulated at least 47units;
ii. successfully presented at least two seminars: proposal and final seminars;
iii. fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University; and
iv. A thesis describing the original work carried out by each candidate while studying for the degree shall be submitted according to university regulations.
v. After the submission of a dissertation, the candidate will be examined orally by a Board of Examiners constituted by the School of Postgraduate Studies.

8.0 COURSE OUTLINE

FIRST SEMESTER		**L T P U**
***BIO 805**	Pests of Stored Products	2 0 3 3
***BIO 813**	Statistical Methods and Experimental Design	2 0 3 3
***BIO 833**	Medical and Veterinary Entomology	1 0 3 2
BIO 851	Research Methods	1 0 3 2
BIO 853	Advanced Insect Diversity, Taxonomy& Physiology	2 0 3 3
BIO 855	Environmental Management	1 0 3 2
BIO 857	Entomophagy, Sericulture & Apiculture	1 0 3 2
	Total	17

ELECTIVES		
BIO 859	Biological Control and Pests	1 0 3 2
BIO 861	Environmental Entomology	1 0 3 2

SECOND SEMESTER		**L T P U**
*BIO 814	Seminar	1 0 3 2
*BIO 816	Vector and Pest Management	2 0 3 3
*BIO 830	Ecotoxicology	2 0 3 3
BIO 850	Advanced Insect Ecology	2 0 3 3
BIO 852	Insect Pests of field crops	1 0 3 2

BIO 854	Pesticide formulation and application	1 0 3 2
BIO 856	Forest and Urban Entomology	1 0 3 2
BIO 858	Forensic Entomology	1 0 0 1
	Total	18

ELECTIVES

BIO 860	Pesticide Toxicology	1 0 3 2
BIO 862	Aquatic Entomology	1 0 3 2

THIRD SEMESTER		**L T P U**
BIO 899	Master's Thesis Research Project	0 0 36 12
*Courses existing also in other options		

9.0 COURSE SYNOPSIS

BIO 805

PESTS OF STORED PRODUCTS (3 Units)

Biology, Ecology and Control of insect and vertebrate pests of stored products; principles and techniques for pest control for arable crop, plantation crop and stored products. Morphology of insects, rodents and birds involving a description of the various external features and its importance for survival in a storage environment. Behavioral and physiological characteristics of each group. The mode of action and metabolism of pesticides in the control of pests. Chemistry of pesticide action.

BIO 813

STATISTICAL METHODS AND EXPERIMENTAL DESIGN (3 Units)

Simple techniques in experimental designs such as random sampling etc. statistical methods involving central tendencies such as mean, median, mode etc, normal distribution, regression, chi-square, mean separation, multiple range test, Turkey's test, T-test etc. Design CRD, Randomized complete Block Design RCBD, split-plot design etc.

BIO 814

SEMINAR (2 Units)

The seminar will be on a research interest, which will be of high quality and in line with the area of research of the candidates. A written report will be submitted by the student.

BIO 816

VECTOR AND PEST MANAGEMENT (3 Units)

Strategies and all control methods for stored products pests and vectors including physical, mechanical, cultural, chemicals, biological, microbial, biotechnical and integrated techniques. Integrated management in tropical storage environment. Mode of action and metabolism of pesticides used in the control of pests, problems of insecticide toxicity, resistance and residues. The role of birds, fish, amphibians, small mammals and other agents in the management of harmful insects.

BIO 830

ECOTOXICOLOGY (3 Units)

Historic review of human impact on the environment: major pollutants – sulphur dioxide, nitrogen oxide and nitrate, sewage, agricultural wastes, warfare, pesticides, toxic effects of chemical pollutants on populations, communities, and terrestrial, freshwater and marine ecosystems; mechanisms and processes whereby chemicals exert their effects on ecosystem and impact caused at population and community levels. Some specific examples of environmental toxicities e.g. DDT and its environmental impact, organophosphorus pesticides, nitrates and algal bloom etc. methods of environmental monitoring, fate, assessment and behavior of chemicals in the environment. Determination of physico-chemical parameters in terrestrial and aquatic environments.

BIO 833

MEDICAL AND VETERINARY ENTOMOLOGY (2 Units)

Epidemiology, identification, biology and control of insects and other arthropods of medical and veterinary importance. Insect and some other arthropods transmitted diseases, their symptoms and diagnosis, venoms, defense secretions and allergens. Control programmes of tsetsefly, mosquitoes, blackfly etc.

BIO 850

ADVANCED INSECT ECOLOGY (3 Units)

Population growth, theories, life tables, key factors, analysis, regression, co-existence, co-habitation, competition and mutual displacement, variation, speciation and diversity. A mathematical approach to the dynamics of single and multi-species populations and communities with analytical and simulation model techniques. Mathematical and statistical techniques applied to population systems and community ecologies. Critical survey of models of population growth, niche matrices, competition, predation, ecological genetics, species diversity and distribution, ecological succession, use of computer simulations in population of agricultural pests, computer modeling used by ecologists to clarify and interpret large field data by clustering, transformation, matrices and multi-variate analysis.

BIO 851
RESEARCH METHODS (2 Units)
This course will involve both theory and practical will enable students to be familiar with modern methods and equipment used in entomological researches. Insect sampling, collection and preservation techniques. Culture of insects, microscopy, scanning and transmission electron microscopy, computer software for morphometric and data analysis, data interpretation, bioassays, microtomy, preparation of temporary and permanent slides. Use of different entomological methods and techniques: AAS, GC-MS, HPLC; electrophoresis, centrifugation, PCR methods.

BIO 852 INSECT PESTS OF FIELD CROPS AND CONTROL (2 Units)
Identification, life histories and control of insects attacking field crops, especially those of grains and legumes. The damage that these insects cause, the reason for their abundance, and alternatives in control practices will also be emphasized.

BIO853
ADVANCED INSECT DIVERSITY, TAXONOMYAND PHYSIOLOGY (2 Units)
Taxonomic characteristics of insects, construction and use of keys, principles of insect classification, insect sampling and preservation. The integument, excretion, water and temperature relation and ionic regulation. Principles of insect physiology, function of organs, circulation, reproduction, respiration, neurophysiology, endocrinology and digestion.

BIO 854
PESTICIDE FORMULATION AND APPLICATION (2 Units)
History and scope of development of pesticide application equipment. Pesticide formulations. Different system of application of pesticides, dusting equipment, maintenance and operation of hand dusters, bellow type dusters, rotary hand and power hand dusters. Various types of sprayers including knapsack. Component of a spray machine, maintenance (of all sprayers) and operation of compression and pump systems, granular applicators, comparative study of ground and aerial application equipment, calibration methods and measurement of droplet size. Fog and smoke generators.

BIO 855
ENVIRONMENTAL MANAGEMENT (2 Units)
Concepts and definitions of Environmental/ecological problems. International Environmental Legislation and Agreements. Solution to Ecological problems: Technologies and Approaches, for example Solid wastes: Recycling, Incineration, pyrolysis, fermentation; Waste water treatment technologies: Intensive and Extensive; Air pollution: Scrubbers and Filters. Environmental Impact on Health.

BIO 856
FOREST AND URBAN ENTOMOLOGY (2 Units)
The principles of forest entomology, including detection, collection, identification, appraisal of damage, and control of forest insect pests.

BIO 857
ENTOMOPHAGY, SERICULTURE & APICULTURE (2 Units)
Study of the insect orders that are edible, examples, nutritional composition and processing. Meaning of Sericulture/silk farming, importance of sericulture, production of silk using insects such as *Bombyx mori*, *A naphe venata*. Definition and types of apiculture, care
and management of honey bees for the production of honey and wax.

BIO 858
FORENSIC ENTOMOLOGY (1 Unit)
Biology, ecology and control of insect pests of forensic importance. Insects/arthropods involved in forensic entomology – flies, beetles, mites, moths, warps, etc. stages of decomposition of a body. Post Mortem Intervals (PMI) and its calculations, modern techniques in forensic entomology e.g. scanning electron microscopy, potassium permanganate, etc.

BIO 859
BIOLOGICAL CONTROL OF PESTS (2 Units)
Principles related to the use of arthropods to suppress populations of arthropod pests and weeds. Historic perspective, ecological relationships, and contemporary issues related to the conservation and manipulation of arthropod predators, parasitoids and herbivores.

BIO 860
PESTICIDE TOXICOLOGY (2 Units)
General concepts of insecticide toxicology, theory and principles of bioassay, chemistry and comparative toxicology of some common insecticide, mechanism of action of major groups of insecticide, mammalian and phytotoxicity of insecticides, enzyme activation and inhibition by insecticides at various levels, detoxification mechanism, joint action of insecticides (synergism and antagonism), handling and standardization of insects in

different groups of insecticides under the field and laboratory conditions. Practical: laboratory equipment used in toxicology experiments, gross symptoms produced by representative insecticide groups, relationship between dosages and responses, use of time-mortality determination in comparing the relative toxicity of insecticides, preparation of spectra transmittance and concentration transmittance curves, bioassay of insecticides.

BIO 861
ENVIRONMENTAL ENTOMOLOGY (2 Units)
Diversity of insects in different ecosystems, interactions of various groups of insects with biological, chemical and physical constituents of the environment. Physical and chemical characterization of environmental contaminants, impact of pollutants on insects and non-target organisms at different levels, biological responses to pollutants and biogeochemical cycles, insects as indicators of level of pollution.

BIO 862
AQUATIC ENTOMOLOGY (2 Units)
Aquatic habitats and their insect fauna, insect adaptation to aquatic environment, aquatic insects and water pollution.

BIO 899
MASTER'S THESIS RESEARCH PROJECT (12 Units)
A research project involving an investigation on entomology. The report should be written in a form of a scientific report or paper. An original research work in the area of entomology or pest management.

C). DOCTOR OF PHILOSOPHY [PHD] PROGRAMMES MOUNTED

1. PhD Applied Entomology/Storage Entomology
2. PhD Storage Microbiology
3. PhD Applied Parasitology
4. PhD Environmental Biology
5. PhD Post harvest Biology

a) BASIC ADMISSION REQUIREMENTS FOR DOCTORAL PROGRAMMES
Candidates for Ph.D. Admission must satisfy the following conditions:

i) Candidates must have five credit passes including English, Mathematics, Physics, Chemistry and Biology/Agric. science at '0'Level.
ii) Candidates with Bachelor's degree from an approved university must obtain a minimum of second class lower division with CGPA of 3.0/5.0.
iii) Candidates must have Academic Master's in relevant areas with a CGPA of 4.0/5.0 and thesis score not lower than 60% (B).
iv) Candidates must demonstrate adequate intellectual capacity, maturity and effective decision making and problem-solving potentials.
v) Assessment of iv) above will be in the form of evidence of publication from the Master's thesis together with a well written proposal

b) AREAS OF SPECIALIZATION
Candidates can be specialize in any of the following areas:

I. Storage Entomology
II. Applied Parasitology
III. Storage Microbiology

c) DURATION OF PROGRAMME

i) A full time Doctoral Programme shall run for a minimum of 6 semesters and a maximum of 8 semesters.
ii) Part-time Doctoral Programme shall run for a minimum of 8 semesters and a maximum of 10 semesters.
iii) For extension beyond the specified maximum period a special permission of Senate shall be required.

d) REQUIREMENT FOR GRADUATION
Doctoral (Ph.D.) programmes should primarily be by research. However, Departmental Postgraduate Committee may prescribe some courses of not more than 12 credit units to be taken by the candidates. A Doctoral (Ph.D.) Thesis of 12 credit units **MUST** be defended before a Panel of internal and External Examiners.

- A student shall present at least three seminars, submit and defend a Thesis proposal.
- A student shall carry out research in a relevant area of specialization and submit an acceptable thesis.

e) DOMAIN OF THE PROGRAMMES
The doctoral programme shall be domiciled in the relevant academic Department.

f) STUDENT ENROLMENT
Student enrolment shall be subject to the carrying capacity of the department.

LEARNING OUTCOME FOR DOCTORAL PROGRAMMES
Comprehensive Knowledge of Areas of Specialization

i) Graduates should have comprehensive knowledge about their areas of specialization, encompassing an understanding of the theoretical foundation and quantitative tools of the areas of specialization, as well as the ability to apply this knowledge to solving problems.
ii) Graduates should be able to demonstrate problem solving capacity using multidisciplinary approaches in an innovative and creative way.
iii) A graduate should display comprehensive knowledge of areas of specialization and should have acquired entrepreneurial skills for self sufficiency and also to meet the needs of public and private sectors in Nigeria and beyond.

Problem Solving Capacity

Graduates should be able to demonstrate problem solving capacity through lateral, critical, innovative and creative connections among diverse fields of study in analyzing problems using multidisciplinary approaches.

Global Perspective

Graduates should have a broadened perspective, based on an understanding of both the domestic and global environments. Doctoral research should be international in outlook as indicated by publishability of research data to attract international journal.

Communication Competency and Information Management:

i) Graduates should have a sound understanding of the study area demonstrated by at least a paper published in a reputable National/International journal
ii) Graduates should be proficient in the application of ICT to knowledge generation as well as usage in research and other endeavours.

Social and Ethical Responsibility

i) Graduates should demonstrate ethical considerations and understand the environmental implications of their research and professional activities.
ii) Graduates should endeavour to adhere to international accepted norms and values with respect to unbiased observations, accurate documentation and interpretation of data, and acknowledge all sources of information.

Behavioural Skills

Graduates should understand human behaviour in organizations. They should:

-Have the ability to work and interact effectively in group situation;
-Be disposed to mentoring and peer review;
-To be able to appreciate constructive criticism.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF BIOLOGY

S/N	Name	Qualification	Status	Area of Specialization
1.	Prof. J. O. Akinneye	B. Tech., M. Tech., PhD (Akure)	Professor	Storage Entomology & Techniques
2.	Prof. C. O. Adedire	B. Sc., M. Sc. (Ilorin), Ph.D (Ife)	Professor	Insect Physiology and Pest Management
3.	Prof. T. A. Olusi	B. Sc., Maid., M. Sc. (Ibadan), Ph.D (Jos)	Professor	Parasitology (Immunology & Epidemiology)
4.	Prof. M. O. Ashamo	B.Sc., M. Sc. (Ilorin), Ph.D (Akure)	Professor	Storage Entomology & Pest Management
5.	Prof. (Mrs.) A. T. Aborisade	B.Sc. (Ilorin), M. Sc., Ph.D (Ibadan)	Professor	Food Microbiology & Storage of Perishables
6.	Prof. (Mrs.) O. E. Oladipo	B. Tech., M. Tech., PhD (Akure)	Professor	Storage Entomology & Pest Management
7.	Prof. M. O. Oniya	B. Sc., M. Sc., Ph.D. (Ibadan)	Professor	Parasitology & Public Health
8.	Prof. (Mrs.) B. O. Odiyi	B. Sc., M. Sc. (Ibadan), PhD (Benin)	Professor	Botany & Ecology
9.	Prof. J. A. Adeyemi	B. Sc. (Ilorin), PhD (Lafayette)	Professor	Animal & Environmental Physiology
10.	Prof. B. W. Adu	B.Sc., M. Sc., PhD (Ife)	Professor	Aquatic Entomology/Ecology
11.	Prof. (Mrs.) I. A. Simon-Oke	B. Sc. (Ado-Ekiti). M. Sc. (Ibadan), PhD (Ado-Ekiti)	Professor	Parasitology & Public Health
12.	Prof. O. J. Afolabi	B. Tech. (Akure), M.Sc. (Zaria), PhD (Benin)	Professor	Parasitology & Public Health
13.	Dr. K. L. Akinwande	B. Sc., M. Sc. (Lagos), PhD (Ife)	Reader	Applied Entomology
14.	Dr. O. A. Alabi	B.Sc. (Ilishan- Remo). M. Sc.. PhD	Reader	Genetic and Molecular Toxicology
15.	Dr. K. D. Ileke	B. Tech., M. Tech., PhD (Akure)	Reader	Entomology, Vector & Pest Management
16.	Dr. O. M. Akomolafe	B. Tech., M. Tech., PhD (Akure)	Senior Lecturer	Storage Microbiology
17.	Dr. E. O. Onagbola	B. Tech., M. Tech. (Akure), PhD (Auburn)	Senior Lecturer	Entomology & Integrated Pest Management
18.	Dr. O. O. Oladele	B. Tech., M. Tech., PhD (Akure)	Senior Lecturer	Storage Microbiology & Plant Pathology
19.	Dr. A. A. Sorungbe	B. Sc., M.Sc., PGD (Comp) (Ife), PhD (Akure)	Lecturer I	Insect Cytogenetics & Genetics
20.	Mr. S. E. Abiya	B.Sc., (Abakaliki). M. Sc., (Port Harcourt)	Lecturer I	Plant Science & Ecology
21.	Dr. E. A. Oyeniyi	B. Tech. (Ogbomoso), M. Tech. (Akure), Ph. D (Ado-Ekiti)	Senior Lecturer	Environmental Biology & Insect Physiology
22.	Dr. B. M. Macaulay	B. Tech., (Akure). M.Sc.. (Greenwich) Ph.D (Manchester)	Lecturer I	Ecotoxicology
23.	Dr. G. A. Ogunwole	B. Sc., M. Sc. Ph. D (Lagos)	Lecturer I	Environmental Toxicology & Pollution Management
24.	Dr. O. B. Awosolu	B. Sc., M. SC.. (Ilorin) Ph.D (Penang)	Lecturer I	Parasitology & Public Health

9.8.3 DEPARTMENT OF MICROBIOLOGY POSTGRADUATE CURRICULUM

1. Postgraduate programmes offered:

(a) PGD
(b) M.Tech.
(c) Ph.D

2. Available options:

(a) PGD

i. Food and Industrial Microbiology
ii. Environmental Microbiology
iii. Medical Microbiology

(b) M. Tech.

i. Food Microbiology
ii. Environmental Microbiology
iii. Medical Microbiology

(c) Ph. D

i. Food Microbiology
ii. Environmental Microbiology
iii. Medical Microbiology

3. Philosophy and objectives:

(a) PGD:

The objectives of the programme are to:

i. serve as a bridge to take care of deficiencies in microbiology courses of HND graduates and other relevant disciplines
ii. train graduates in other relevant fields, the rudiments of microbiology, which will satisfy the manpower needs of industries, Hospitals and other relevant institutions

(b) M. Tech:

The objective of the M. Tech. Programme in Microbiology is to train first degree graduates of this University and elsewhere on the principles of:

i. Food Microbiology: To assess the microbial composition, spoilage and preservation of foods, food sanitation, detection of food-borne pathogens that cause infections.
ii. Environmental Microbiology: Microbial activities in the environment, consequences of their activities on man and animals and how their activities can be controlled or managed and harnessed.
iii. Medical Microbiology: Microbial infections, etiology, epidemiology, pathogenesis, antimicrobial chemotherapy and antimicrobial resistance, infection and immunity.

(c) Ph.D:

The objective of the Ph. D. Programme in Microbiology is to train M. Tech. (or its equivalent) graduates of this University and elsewhere to specialize in any area of Microbiology.

4. Admission Requirements:

(a) PGD

The following categories of candidates can be admitted into the PGD Microbiology

i. Third class graduates of Microbiology
ii. Graduates of other relevant disciplines
iii. HND in relevant discipline with minimum of lower credit

(b) M. Tech.

In addition to the University's general regulations and guidelines on Postgraduate admission, graduates of Microbiology and Graduates of Botany, Biology, Biochemistry, Agricultural Biology, Food Science and Technology, Molecular Biology and Biotechnology who have done PGD in Microbiology with a CGPA of 3.50 may be considered for admission.

(c) Ph. D

In addition to the University's general regulations and guidelines on Postgraduate admission, graduates with minimum CGPA of 3.50 or 60% at Master's level in Microbiology are considered for admission to Ph.D. degree programme.

5. Duration

(a) PGD

Full Time: 24 months/4 semesters

(b) M. Tech

See the regulation of the University on this**.**

(c) Ph. D

See the regulation of the University on this

6. Requirement for Graduation:

(a) PGD

Candidates must register for a minimum of sixty (60) course units and six (6) units of independent project.

(b) M.Tech

i. A dissertation of original research work is expected to be carried out and submitted to the University at the end of the training. Candidates will be examined orally by a Board of Examiners. The composition of which is as stipulated in the University regulations on such matters.
ii. Candidates must offer and normally maintain a minimum of "B" average (60-69%) in core compulsory courses and a minimum of 30 units of study are required for graduation.
iii. Full-time candidates shall enrol for not more than **21** units and Part-time candidates for not more than **15** units in any one semester.

(c) Ph.D

i. A candidate who registers for the Ph.D. programme must in consultation with his supervisor present seminar and submit to the Department at the end of the first semester a comprehensive research proposal for assessment by a committee set up by the Department.
ii. The candidate must in consultation with his supervisor present three seminars for assessment and contributions by the Department.
iii. On completion of the research project, the candidate will be required to present a seminar on the findings of the work done.
iv. A thesis describing and explaining the original work carried out and written in the format specified by the Postgraduate School must be submitted at the end of the programme.
v. On submission of the thesis, the candidate will be examined orally by a Board of Examiners according to University regulation.

7. Programme Structure:

(a) PGD

POST GRADUATE DIPLOMA CLASSIFICATION

This is based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme.

70% - 100% A 5
60% - 69% B 4
50% - 59% C 3
45% - 49% D 2
40% - 44% E 1
Below 40% F 0

CGPA	CLASS OF DIPLOMA
4.50-5.00	DISTINCTION
3.50-4.49	UPPER CREDIT
2.45-3.49	LOWER CREDIT
1.00-2.49	PASS

SUMMARY

Good standing (GS)
Absent (AB)
Probation (PR)
Extended probation (EP)
Caution (CA)
Withdrawal (WD)

OTHERS

Incomplete
Audited
Dean's List

i. Food and Industrial Microbiology

COURSE OUTLINE

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 711(C)	Biostatistics	2	1	0	3
MCB 713(C)	Microbial Physiology & Metabolism	2	0	3	3
MCB 715(C)	Microbial Ecology	2	1	0	3
MCB 727(C)	Microbiological Techniques	2	0	3	3
MCB 733(C)	Quality Control in Microbiology	2	1	0	3
MCB 739(C)	Research Method and Instrumentation	2	1	0	3
MCB 743(C)	General Microbiology 1	2	0	3	3
	Total	14	4	9	21

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 718(C)	Bacteriology	2	0	3	3
MCB 720(C)	General Virology	2	1	0	3
MCB 724(C)	Microbial Genetics	2	1	0	3
MCB 738(C)	General Parasitology	2	0	3	3
MCB 740(C)	Mycology	2	0	3	3
MCB 742(C)	Seminar	2	0	0	2
MCB 744(C)	General Microbiology II	2	0	3	3
	TOTAL	14	2	12	20

THIRD SEMESTER

Course code	Course Title	L	T	P	Units
MCB 721(c)	Food Microbiology	2	0	3	3
MCB 731(c)	Fermentation Technology	1	1	0	2
MCB 735(c)	Industrial Microbiology	2	1	0	3
MCB 741(c)	Nutraceuticals	1	1	0	2
MCB 749(c)	Pathogenic Microbiology	2	1	0	3
MCB 753(c)	Molecular Biology	2	1	0	3
MCB 763(c)	Food processing	2	0	3	3
	TOTAL	12	5	6	19

FOURTH SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 799(c)	Research Project	0	0	18	6
	Total	0	0	18	6

ii. Environmental Microbiology

COURSE OUTLINE

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 711(C)	Biostatistics	2	1	0	3
MCB 713(C)	Microbial Physiology & Metabolism	2	0	3	3
MCB 715(C)	Microbial Ecology	2	1	0	3
MCB 727(C)	Microbiological Techniques	2	0	3	3
MCB 733(C)	Quality Control in Microbiology	2	1	0	3
MCB 739(C)	Research Method and Instrumentation	2	1	0	3
MCB 743(C)	General Microbiology 1	2	0	3	3
	Total	14	4	9	21

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 718(C)	Bacteriology	2	0	3	3
MCB 720(C)	General Virology	2	1	0	3
MCB 724(C)	Microbial Genetics	2	1	0	3
MCB 738(C)	General Parasitology	2	0	3	3
MCB 740(C)	Mycology	2	0	3	3
MCB 742(C)	Seminar	2	0	0	2
MCB 744(C)	General Microbiology II	2	0	3	3
	TOTAL	14	2	12	20

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 719(c)	Aquatic Microbiology	2	0	3	3
MCB 735(c)	Industrial Microbiology	2	0	0	2
MCB 745(c)	Petroleum Microbiology	2	1	0	3
MCB 747(c)	Plant Pathology	1	0	3	2
MCB 749(c)	Pathogenic Microbiology	2	0	3	3
MCB 753(c)	Molecular Biology	2	1	0	3
MCB 759(c)	Soil Microbiology	2	1	0	3
	Total	13	0	9	19

FOURTH SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 799(c)	Research Project	0	0	18	6
	Total	0	0	18	6

iii. Medical Microbiology

COURSE OUTLINE

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 711(C)	Biostatistics	2	1	0	3
MCB 713(C)	Microbial Physiology & Metabolism	2	0	3	3
MCB 715(C)	Microbial Ecology	2	1	0	3
MCB 727(C)	Microbiological Techniques	2	0	3	3
MCB 733(C)	Quality Control in Microbiology	2	1	0	3
MCB 739(C)	Research Method and Instrumentation	2	1	0	3
MCB 743(C)	General Microbiology 1	2	0	3	3
	Total	14	4	9	21

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 718(C)	Bacteriology	2	0	3	3
MCB 720(C)	General Virology	2	1	0	3
MCB 724(C)	Microbial Genetics	2	1	0	3
MCB 738(C)	General Parasitology	2	0	3	3
MCB 740(C)	Mycology	2	0	3	3
MCB 742(C)	Seminar	2	0	0	2
MCB 744(C)	General Microbiology II	2	0	3	3
	TOTAL	14	2	12	20

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 723(c)	Immunology and Immunochemistry	3	0	3	4
MCB 725(c)	Pharmaceutical Microbiology	2	0	3	3
MCB 747(c)	Plant pathology	2	0	3	3
MCB 749(c)	Pathogenic Microbiology	2	0	3	3
MCB 751(c)	Principle of Epidemiology and Public Health	2	0	0	2
MCB 753(c)	Molecular Biology	2	0	0	2
MCB 755(c)	Applied Parasitology	2	0	0	2
	Total	15	0	12	19

FOURTH SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 799(c)	Research Project	0	0	18	6
	Total	0	0	18	6

(b) M. Tech:

MASTERS DEGREE CLASSIFICATION

This is based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme.

70% - 100% A 5
60% - 69% B 4
50% - 59% C 3
45% - 49% D 2
40% - 44% E 1
Below 40% F 0

CGPA	CLASS OF DIPLOMA
4.50-5.00	DISTINCTION
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1.00-2.49	PASS

SUMMARY

Good standing (GS)
Absent (AB)
Probation (PR)
Extended probation (EP)
Caution (CA)
Withdrawal (WD)

OTHERS

Incomplete
Audited
Dean's List

i. Food Microbiology

COURSE OUTLINE

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 801 (C)	Methodology and Instrumentation	1		3	2
MCB 803 (C)	Biostatistics	2	1		3
MCB 805 (C)	Microbial Flora of Foods				2
MCB 807 (C)	Advanced Food Processing				2
MCB 809 (C)	Microbial Examination of foods				2
MCB 811 (C)	Advanced Food Fermentation				2
MCB 827 (C)	Advanced Microbial Genetics I	2		1	3
MCB 829 (C)	Food Safety and Food Security				2
TOTAL					18

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 802 (C)	Microbial spoilage of foods	1		3	2
MCB 804 (C)	Food preservation & Control of Spoilage				2
MCB 806 (C)	Applied Enzymology	2		3	3
MCB 808 (C)	Bio-degradation &Bio-deterioration				2
MCB 812 (C)	Quality Control and Industrial Practice	1		3	2
MCB 814 (C)	Seminar				2
MCB 826 (C)	Advanced Microbial Genetics II	2		1	3
MCB 828 (C)	Biotic Foods				2
TOTAL					18

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 899(C)	Research Project				12
TOTAL					12

Key: C= Core or Compulsory Courses

ii. **Environmental Microbiology**

COURSE OULINE

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 801(C)	Methodology and Instrumentation				2
MCB 803(C)	Biostatistics				3
MCB 815(C)	Advanced Microbial Ecology				2
MCB 817(C)	Advanced Aquatic Microbiology				2
MCB 819(C)	Advanced Soil microbiology				2
MCB 821(C)	Advanced Microbiology of Air				2
MCB 827 (C)	Advanced Microbial Genetics I	2		1	3
TOTAL					16

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 808 (C)	Biodegradation and Biodeterioration				2
MCB 812 (C)	Quality Control and Industrial Practices	1		3	2
MCB 814 (C)	Seminar				2
MCB 816(C)	Management of Land and Air Pollution				2
MCB 818 (C)	Sewage and Water Treatment Technology				2
MCB 820 (C)	Epidemiology and Public Health				2
MCB 826 (C)	Advanced Microbial Genetics II	2		1	3
TOTAL					15

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 899(C)	Research Project				12
TOTAL					12

Key: C= Core or Compulsory Courses

iii. **Medical Microbiology**

COURSE OUTLINE

FIRST SEMESTER

Course Code	Course Title	L	T	P	Units	
MCB 801(C)	Methodology and Instrumentation	1		3	2	
MCB 803(C)	Biostatistics				3	
MCB 825(C)	Advanced Pharmaceutical Microbiology					2
MCB 813 (C)	Special Topics in Immunology				3	
MCB 823 (C)	Medical Bacteriology				3	
MCB 827 (C)	Advanced Microbial Genetics I	2		1	3	
TOTAL					16	

SECOND SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 812(C)	Quality Control and Industrial Practices	1		3	2
MCB 814(C)	Seminar				2
MCB 820(C)	Epidemiology and Public Health				2
MCB 822 (C)	Medical Virology				3
MCB 824 (C)	Medical Mycology				3
MCB 826 (C)	Advanced Microbial Genetics II	2		1	3
TOTAL					15

THIRD SEMESTER

Course Code	Course Title	L	T	P	Units
MCB 899 (C)	Research Project				12
TOTAL					12

Key: C= Core or Compulsory Courses

8. Course Synopses

(a) PGD:

MCB 711: BIOSTATISTICS (3 units)

Objectives and scope of research. Research procedures and materials selection. Preparation of report. Definition of statistical terms. Representation of numerical data. Data summarization, frequency, relative frequency, etc. Measures of central tendency, measure of dispersion.

MCB 713: MICROBIAL PHYSIOLOGY AND METABOLISM (3 units)

Aspects of microbial physiology; a revision of cell structure and function; growth and death of microorganism, nutrition; types of in relation to their energy metabolism and biosynthetic activity.

MCB 715: MICROBIAL ECOLOGY (3 units)

Microbes and ecology theory. Physiological, morphological, and genetic adaptation of microorganism to their environment. Microbial interactions. Microorganisms in ecosystems microbial bioconversions.

MCB 718: BACTERIOLOGY (3 units)

This course explains the history of bacteria, structure and functions of parts of the structure. It lets students know more about the bacterium as a living organism that has size, shape, metabolizes, feeds and grows although they are miniature in nature and cannot be seen with the naked eye. The student is exposed to the knowledge of the mode of nutrition in bacteria, the growth curve including the lag, log, stationary and decline phases. The students will be able to calculate the generation time for a bacterium and know that it differs from one bacterium to the other. This course further introduces and exposes the students to the knowledge of pathogenicity in bacteria. They will know what pathogens are, some common bacterial diseases and their causative organisms, the sources, symptoms, treatment and control of the infection. They will be able to know the different sources for the isolation of different bacteria. The Koch's postulate is presented to the students as an experimental procedure for isolating and identifying organisms responsible for particular diseases. Students will know theoretically and practically, how to isolate, identify and characterize bacteria.

MCB 719: AQUATIC MICROBIOLOGY (3 units)

Nature of aquatic environment; microbiology of water supply, microbial flora of surface and ground waters; water treatments; water supply and public health. Conventional and advanced water treatment in hot climate and the use of water in agricultural irrigation, fish culture, industrial and for municipal purposes; sewage and sewage disposal in hot climate, microbial aspect of water management; eutrophication and bioremediation, evolution, ecology and diversity of the marine environment, origin of life in the sea and the evolutionary patterns suggested by the marine fossil bed; major marine environment such as coral reefes, the deep sea floor, hydrothermal vent, the open ocean and the rotated zone diversity of plants and animals in each environment and the adaptation they have to vastly different conditions.

MCB 720: GENERAL VIROLOGY (3 units)

Historical background and development of virology. Structure and composition of viruses. Mechanisms of viral replication/infections; lytic, latent/persistent viral infections. Bacteriophages. Plants and animal viruses. Viruses and diseases. Oncogenic viruses. Antiviral drugs and agents such as interferons. Techniques in virology; electron microscopy, serology, electrophoresis, collection, processing and analysis of samples for virological assays.

MCB 721: FOOD MICROBIOLOGY (3 units)

The occurrence and interactions of microorganisms with food. Intrinsic and extrinsic parameter of foods that affects microbial growth. Methods of detecting the presence of microbes in foods. Milk, meats and water microbiology. Effects of microbial growth on food fermentation, spoilage and food borne diseases. Food sanitation and microbiological food quality control. Microbial indicators of food sanitary quality (coliform bacteria, enterococci etc.)

MCB 723: IMMUNOLOGY AND IMMUNOCHEMISTRY (3 units)

Basic concept of immunology, antigen and antibody interaction. Modern techniques in immunochemistry. Diagnostic application of antigen antibody reactions e.g. Wasserman's test, blood grouping, pregnancy test, etc. Immune responses. Transplantation immunology, histocompatibility, antigens, graft versus host reactions. Tumour immunology and hypersensitivity reactions, tolerance, immunoprophylaxis and serotherapy

MCB 724: MICROBIAL GENETICS (3 units)
Current status of microbial genetics (bacteria, fungi, viruses and protozoa). Methods and findings in the area of mutagenesis, inductions, isolation and biochemical characterization of mutants. Adaptation, transformation, transduction, conversion and conjugation. Techniques in microbial genetics; experiments with virulent phages, template phages and lysogenic bacteria, fungi and other lower eukaryotic genetics.

MCB 725 – PHARMACEUTICAL MICROBIOLOGY (3 units)
Different types of their chemotherapeutic agents and antibiotics**,** chemistry and synthesis. Mode of action and assay of anti-microbial agents; concept of antibiotic sensitivity and resistance. Quality control of pharmaceutical products.

MCB 727: MICROBIOLOGICAL TECHNIQUES (3 units)
Sterilization and disinfection. Culturing and sub culturing, preservation and storage of culture, inoculation techniques, formulation and preparation of media. Isolation of microorganisms (Microscopy and Spectrophotometry). Identification of microorganisms.

MCB731: FERMENTATION TECHNOLOGY (2 units)
Basic concepts of fermentation; alcoholic fermentation; resulting in production of bread, beer, wine and vinegar acid, fermentation leading to the production of cheese, butter, yoghurt, etc; malolactic fermentation

MCB 733: QUALITY CONTROL IN MICROBIOLOGY (3 units)
This course will x-ray the use of microorganisms as reagents in qualitative and quantitative analysis. The measurement of microbial responses in assays and interpretation of results will be highlighted in this course. The issue of plant sanitation, quality control and microbiological standards and specifications will also be discussed

MCB 735: INDUSTRIAL MICROBIOLOGY (3 units)
Nature of industrial microbiology, microorganisms of industrial importance; Aspects of the Biology of moulds, yeast, bacteria, actinomycetes and viruses of importance in various fermentation. Culture techniques and maintenance of selected cultures. Mutation, strain selection and development, hybridization. Media formulation and economic optimization of fermentation media on laboratory scale. Perimeter design operation. Antifoams. Aspects of biochemical engineering; patent and patent laws. Production of mammalian provided substances by engineered microorganism (interferon, insulin, serum and albumin etc.).

MCB 738: GENERAL PARASITOLOGY (3 units)
This course is designed to give a broad overview of general parasitology, with respect to types of parasites, nature of parasitism, advantages and disadvantages of parasitism. The course encompasses: Life cycle of some common parasites of man and animals, epidemiology and molecular biology of some tropical parasites; Field survey and laboratory methods in Parasitology; Concepts of hyperparasitism; Parasitology and the millenium development goal; Molecular basis of malarial pathology; Antimalaria drug resistance; Function and metabolism of trechalose in nematode worms; Reserve genetics of the model nematodes; Identification of novel antiparasitic reagents.

MCB 739: RESEARCH AND METHODS INSTRUMENTATION (3 units)
Sterilization techniques; chemical separation techniques including chromatography, molecular sieves, ion-exchange, fraction collector, electrophoresis, density gradient and fractional distillation, configuration and electron microscopy, photography; scientific writing-literature sources and retrieval; scientific illustrations and visual aids.

MCB 740: MYCOLOGY (3 units)
Mycology is a branch of Microbiology which involves the study of fungi. The course focuses on history, classification, identification and relevance of fungi to microbiology. Topics to Fungi, Fungi and the Challenges of the Millennium Development goals, classification, Laboratory Methods in Mycology, Collection and transportation of Fungal samples, Storage and processing of samples for mycological studies, be covered include Introduction and Course Overview, History of Mycology, Why study Fungi, Economic Importance of Demonstration of Koch's postulate, Structure, life cycle growth and development of fungi, Pathology and immunology of superficial systemic mycoses and actinomycoses, Fungi genetics and growth, Nutrition in Fungi, Fungi as heterotrophs Fungi physiology and metabolism, Fungi and Human affairs.

MCB 741 NUTRACEUTICAL (2 UNITS)
What are nutraceuticals? Economic importance of nutraceuticals. Some selected African foods with nutraceutical properties, edible macrofungi as sources of nutraceuticals. Development of nutraceuticals food using biotechnology. Differences between nutraceuticals and pharmaceuticals.

MCB 742: SEMINAR (2 units)
Oral and written presentation of an approved topic in Microbiology

MCB 743: GENERAL MICROBIOLOGY I (3 units)
Historical aspects of Microbiology with emphasis on the place of microorganisms in the world. Types of microorganisms – Bacteria, Viruses, Fungi, Riskettsiae, Chlamydia, protozoa, Algae, etc., growth and reproduction of microorganisms. Sterilization and disinfection; Control of Microorganisms by physical and chemical methods.

MCB 744: GENERAL MICROBIOLOGY II (3 units)
Microbial taxonomy with emphasis on systematic classification of bacteria, fungi, viruses, algae, protozoa etc. Isolation, characterization and identification of microbes. Biological and Biochemical reactions of microorganisms. Applied areas of microbiology; Bacterial cell structure and function, genetic system of bacteria; Bacteriophages of plasmids; Microbial growth and metabolism; Energy and nutrient harvesting microorganisms and the environment; Control of microorganism; Introduction to viruses and immunology; Metabolic diversity among microorganism (photoantorophs, photohetertrophes, chemantotrophes; The growth of bacterial cultures (bacterial division, generation time, logarithmic representation of bacterial populations, phases of growth, direct measurements of microbial growth, estimating numbers by indirect methods).

MCB 745 PETROLEUM MICROBIOLOGY (3 units)
Morphology and biostratography of major groups of microfossils. Biological origin and accumulation of petroleum and sedimentary basis. Microbial aspect of gene is petroleum. Microbial indicators in oil prospecting. Tertiary recovery of oil by means of microorganism. Microbial degradation of petroleum products and use of microorganisms in oil clean-up operations. Oil spillage, hydrocarbonoblastic bacteria; metallomonass bacteria that cause rusting oil pipes; role of microorganisms in corrosion of oil fields equipments.

MCB 747: PLANT PATHOLOGY (2 units)
Principles and concepts in plants pathology; some disease of plants, animal and especially those prevalent in Nigeria. The geographical distribution of the pathogens; their isolation, identification, morphology, life cycles, source of inoculums, transmission and the effects on the host, etiology, cultural characteristics, and clinical manifestations of specific bacteria; viral and fungal pathogens of animals and plants; control of plant disease.

MCB 749: PATHOGENIC MICROBIOLOGY (3 units)
Principle of infection, etiology, epidemiology, pathogenic mechanisms, clinical symptoms. Laboratory diagnosis, prophylactic and therapeutic procedures. Control and prevention of selected infections: viral, bacterial, protozoan and fungal diseases of man, especially those prevalent in Africa.

MCB 751 PRINCIPLE OF EPIDEMIOLOGY AND PUBLIC HEALTH (3 units)
Nature of epidemiological investigations. Spectrum of infections; herds immunity and latency of infections; multifactorial systems in epidemics; zoonoses, Antigenic drifts, Biological products for recommended immunization schedules, international control of infectious diseases; statistical application to epidemiology.

MCB 753 – MOLECULAR BIOLOGY (3 units)
Biogenesis, molecular structures and properties of molecular microtubules; mitochondria, chloroplast, membranes (nuclear and cytoplasmic), cell walls and other cellular structures. Membrane- membrane interactions. Biogenetics: different forms of energy existing in microorganisms; activation energy, catalysis and microbial enzymes as biocatalysts. Oxidation – reduction reactions; catalysis carriers. Energy release in microorganisms; substrate – level phosphorylation and electron – transport phosphorylation. Introduction and application of thermodynamics to chemical reactions in microbial systems.

MCB 755 APPLIED PARASITOLOGY (3 units)
Biology of some parasites of man and domestic animals in the tropics. These include classification, distribution, incidence, morphology, natural history, pathogenicity, laboratory diagnosis, therapeutic and prophylactic measures. Immunology of parasitic infection and the role of vectors in the transmission of parasitic diseases will also be taught. A broad and multi-disciplinary approach to the complex and dynamic relationship between parasites and their hosts. Covering life-cycles, ecology, physiology; Both protozoans and helminthes will be considered with emphasis on the most important parasites of human studies including; immune response to parasites; chronicity of infection and its significance; host pathology; evasion of host responses by parasites, serodiagnosis, vaccination, chemotheraphy and drug resistance; genetic resistance to parasitic infection;

relevance of parasitic infections to society; indepth study of malaria with focus on the pathology; immunology and chemotheraphy of this most important human patristic

MCB 759 SOIL MICROBILOLOGY (3units)
Characteristics of soil environment; microbial and fauna of soil; microbial activities in soil, nitrogen cycle, carbon cycle; mineral transformation by microorganisms; ecological relationship among the soil pathogen; effects of peptides on soil microorganisms; biodegradation and biofuel generation.

MCB 763: FOOD PROCESSING (3 UNITS)
Principles and practice of food processing; techniques of processing and preservation of Nigerian foods with regard to their physio-chemical properties; canning containers; outline of caning operations; principal spoilage organisms in canned foods; use of radiation in food preservation; insect contamination as spoilage organisms; laboratory examination of canned foods; methods of detecting contaminants in food

MCB 799: RESEARCH PROJECT (6 units)
An original research project involving an investigation into a specific problem in Microbiology. The project will require both oral and written presentation to be examined and tested by external examiners, approved by Senate.

(b) M. Tech MCB 801 – Methodology and Instrumentation
(2 Units)
Sterilization techniques; chemical separation techniques including chromatography, molecular sieves, ion-exchange, fraction collector, electrophoresis, density gradient and fractional distillation; configuration and electron microscopy, photography; scientific writing – literature sources and retrieval; scientific illustrations and visual aids.

MCB 802: Microbial Spoilage of foods (2 Units)
Microorganisms and the type of spoilage they cause, consequences of food spoilage – food borne illness, food infections and food poisoning; Determinants of microbial spoilage of some selected foods; factors affecting spoilage of foods; control of food spoilage.

MCB 803 – Biostatistics (2 Units)
Statistical notation, averages and standard deviations, normal distribution, t-distribution and confidence limits; statistical hypothesis and test of significance; Linear correlation and regression; principles of experimental design and analysis of variance involving completely randomized design, randomized complete block design, Latin square design, split-plot-design, factorial experiment and their applications in biological experimentation.

MCB 804: Food Preservation and Control of Spoilage (2 Units)
Prevention or delay of microbial decomposition of foods, prevention of self-decomposition of foods, prevention of microbial damage during handling, by animals, by insects etc. Use of chemical preservatives both organic and inorganic rules governing use of preservatives; Application of low temperature, drying etc.

MCB 805: Microbial Flora of Foods (2 units)
Sources of Microorganisms in foods, contaminants from the natural environment, contaminants during processing and handling. Contamination of fruits and vegetables and their products, contamination of meat and meat products, eggs and poultry, fish and sea foods, milk and milk products, sugar and sugar products, cereals and products, factors influencing types of microorganisms in foods, factors affecting growth of microorganisms in foods.

MCB 806 – Applied Enzymology (2 units)
Classification and nomenclature of enzymes; characterization of the main enzyme groups; survey of chemical kinetics, catalysis, order of reactions; Michealis – Menten kinetics; Thermodynamics of enzymic reactions; effect of pH on enzyme specificity; inhibition of enzymes, types of inhibition; investigation of the active centre; enzymes with more than one active centre; co-operatively between active centres; mechanism of enzyme action; role of enzymes in microbial and plant metabolism; Laboratory work involving isolation and purification of microbial and plant enzymes, and quantitative determination of the intermediate and end products.

MCB 807: Advanced Food Processing (2 units)
Techniques of processing preservation of Nigerian foods with regard to their physiochemical properties.
Principles and practices of food processing. Canning, containers, outline of canning operation, principal spoilage microorganisms to canned foods. Use of Irradiation in food preservation; Laboratory examination of canned foods.
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MCB 808: Biodeterioration and Biodegradation (2 units)
Types of deterioration and spoilage materials. Physical and chemical properties of such materials and how they

are affected by activities of biodeteriogenic organisms. Measures of counter biodeteriogenic processes and their economic consequences.

MCB 809: Microbiological Examination of foods (2 units)
Microbiology of foods. Methods of enumerating, isolation and identifying microorganisms important in food processing, preservation and distribution of foods. Predictive Microbiology: Concept and Principles.

MCB 810 – Research Project (12 Units)
A research project involving investigation on a selected Microbiological problem. The project is to be written up as a dissertation.

MCB 811: Advanced Food Fermentation (2 Units)
Microbial fermentations, Microbial production of drinks such as beer, wine, liquors, distilled carbonated soft drinks, local traditional alcoholic beverages, bread, dairy products, Nigerian fermented foods such as Ogiri, soy-Iru, fufu, soy-Ogi, Lafun, Ukpaka, Cocoa Beans, Warankasi, Gaari.

MCB 812: Quality Control and Industrial Practices (2 units)
Functions of Quality Control, its relationship with other departments in the industry sampling, inspection and assay, continuous sampling. Measurements and control Industrial Hygiene. Work Practices spoilage response of chemicals. Safety information Toxicology information and laboratory hygiene, setting up a quality control unit.

MCB 813: Special Topics in Immunology (3 units)
The immune system; organs and cells of the immune system. Mechanisms of immunity. Cytokines. Cancers of the immune system. Immune response. Immune disorders. Immunchematology. Transplantaion Immunology. Vaccinations/Immunizations. Clinical applications in diagnosis of infections. Autoimmune Diseases, Allergic Diseases, Immunologic Deficiency Diseases, HLA and Diseases, Nutrition and Immunity.

MCB 814: Seminar (2 Units)
This is also known as independent study or research. Each student will deliver a Seminar on selected topics and submit a write up on the topic selected.

MCB 815 – Advanced Microbial Ecology (2 Units)
Microbial Ecology and the Ecosystem; the Genome as a component of the Ecosystem; characteristics of Microbial Ecosystems; Microbial Associations; Techniques for the study of Microbial Ecosystems.

MCB 816 – Management of Land and Air Pollution (2 Units)
Types of land pollution; methods of solid waste disposal in Nigeria; techniques of better waste management; Biogas technology; Possible sources of air pollution; Effects of Air pollutants on man & plants. Microbial indicators of air pollution. Various methods of air sampling; control methods of air pollution.

MCB 817 – Advanced Aquatic Microbiology (2 Units)
Microorganisms associated with the aquatic environment. Distribution of microorganisms in the aquatic environments, Role and Importance of aquatic microbial ecosystem. Factor affecting the distribution of microorganisms in such environment; Eutrophication and the various algae involved. Sources of nutrients and factors responsible for eutrophication; Consequences of eutrophication on the Nation's economy; various methods of control of eutrophication.

MCB 818 – Sewage and Water Treatment Technology (2 Units)
Sewage and other oxygen demanding wastes; types of microorganisms that could be found in water as a result of sewage pollution; Detection of faecal contamination; Sewage treatment process; sewage lagoons, Trickling filter method; Anaerobic digestion; Removal of refactory compounds; Water treatment technology; Water borne diseases.

MCB 819 – Advanced Soil Microbiology (2 Units)
The soil environment; the microbiota of the soil; microorganisms as agents of geochemical change. The cycles of matter; the phosphorus cycle; the cycles of carbon & Oxygen; Nitrogen cycle; Sulfur cycle. The cycle of matter in anaerobic environments. The cycle of matter through geological time. The influence of man on the cycle of matter. Degradation of pesticides. Factors affecting microbial population in the soil. Relationship between higher plants and soil microorganisms. Ecological consequences of oil spill.

MCB 820 – Epidemiology and Public Health (2 Units)
Principles of Epidemiology and Public Health; Nature of epidemiological investigations; the role of Laboratory in epidemiological studies; Sources and mode of spread of infections; Communicable diseases in Nigeria; and preventive measures.

MCB 821 – Advanced Microbiology of Air (2 units)
The microbial content of air; Techniques for Microbial Analysis of Air; Implication on the health of man. Human airborne infections; Factors affecting the presence of

microorganisms in the atmosphere composition if unpolluted dry air of the atmosphere.

MCB 822- Medical Virology (3 Units)
Viruses of Medical importance; pathogenesis and clinical features, Laboratory diagnosis, therapeutic and prophylactic measures & epidemiology. Antiviral agents, Applied serology, Immunity.

MCB 823 – Medical Bacteriology (3 Units)
Bacterial pathogens of man and associated diseases. Pathogenesis, Laboratory diagnosis; biochemical testing of bacteria, serologic diagnosis, therapeutic and prophylactic measures and epidemiology. Safety in Microbiology, Chlamydiae and associated diseases, Rickettsiae and associated diseases, Mycoplasmas and associated diseases.

MCB 824 – Medical Mycology (3 Units)
Fungi of medical importance especially in the tropics; pathogenesis, laboratory diagnosis, treatment, epidemiology and control.

MCB 825 – Advanced Pharmaceutical Microbiology (2 units)
Antibiotics and other antimicrobial agents of microbial origin. Vitamins, enzymes and amino acids obtained from microbes and their pharmaceutical importance.

MCB 826- Advanced Microbial Genetics I (3 Units)
Structural and functional genomics: definition, historical prospective and strategies. Genome Structure: genome sizes, microbial and organelle genome, genome physical mapping and sequencing, tools in genome analysis. Structural and functional annotations of genes and genomes. An overview of microbial genome projects. Regulation of gene expression in microorganisms: operon concept, repression of the *lac* operon, regulation of tryptophan biosynthesis operon by attenuation, catabolite repression instability of bacterial RNA, positive and negative regulation, inducers and co-repressors. Negative regulations - *Escherichia coli lac* operon, regulation of the heat-shock regulon by an alternate sigma factor, two component regulatory systems. Genetics of bacteria, viruses, algae fungi, etc.

MCB 827- Advanced Microbial Genetics II (3 Units)
Development of microbial strains. Recombinant DNA Technology. Genetic Engineering: description, methods and applications with emphasis on microorganisms. Genetic Library: description and need for genetic library, composition and methodology of library construction. Metagenomics: definition, principles and techniques used in metagenomic, high throughput screening, metagenomics of archealogical samples. Taxonomy and phylogeny: concepts in systematics, taxonomy and phylogeny. Description and various types of phylogenetic trees. Microbial phylogeography, phylogenetic analysis algorithms. Sequencing: different types, techniques and applications of sequencing.

MCB 828- Biotic Foods (2 Units)
Definition of Biotic Foods. Probiotics, Prebiotics, Synbiotics and Pharmabiotics. Characteristics of Probiotics, Prebiotics, Synbiotics and Pharmabiotics. Mechanism of action. Health Benefits. Economic importance.

MCB 829- Food Safety and Food Security (2 Units)
Definition of food safety and food security. Safe food handling practices, food hygiene. Food-borne diseases, food-borne illness. Food infection and food intoxication. Food pathogen, Food spoilers. HACCP. Regulatory Agencies in food-NAFDAC, SON, WHO, FAO, ISO, CODEX Alimentarius. Factors affecting food security e. g. Effect of climate change on food availability. Consequences of food insecurity. Challenges to achieving food security.

LIST OF ACADEMIC STAFF IN THE DEPARTMENT OF MICROBIOLOGY (MCB)

S/N	NAMES	QUALIFICATIONS	STATUS	AREA OF SPECIALIZATION
1.	ONIFADE ANTHONY KAYODE	B.Sc. (Ado-Ekiti), M.Sc. (Ibadan), Ph.D. (Ilorin)	Professor	Plant Pathology / Toxicology
2.	ADEBOLU TINUOLA TOKUNBO	B.Sc., M.Sc., Ph.D. (Ife)	Professor	Infections and Immunity
3.	AKINYELE BAMIDELE JULIET	B.Sc., M.Sc. (Ilorin), Ph.D. (Akure)	Professor	Food Microbiology / Mycology
4.	OLADUNMOYE MUFUTAU KOLAWOLE	B.Sc. (Ife), M.Sc. (Zaria), Ph.D. (Akure)	Professor	Pharmaceutical Microbiology
5.	OYETAYO VICTOR OLUSEGUN	B.Tech. (Akure), M.Sc. (Port-Harcourt), Ph.D. (Akure)	Professor	Food & Industrial Microbiology
6.	AROTUPIN DANIEL JUWON	B.Sc., M.Sc. (Ilorin), Ph.D. (Akure)	Professor	Environmental and Microbial Physiology (Enzymology)
7.	EKUNDAYO FATUYI OLANIPEKUN	B.Sc., M.Sc., Ph.D. (Ibadan)	Professor	Soil & Applied Microbiology
8.	ADEGUNLOYE DEKE VICTORIA	B.Sc. (Abeokuta), M.Tech., Ph.D. (Akure)	Professor	Environmental Microbiology / Bioenergy / Biomass
9.	OMOYA FUNMILOLA OLUYEMI	B.Tech., M.Tech., Ph.D. (Akure)	Professor	Environmental Microbiology and Public Health
10.	OLALEMI ADEWALE OLUWASOGO	B.Tech., M.Tech. (Akure), Ph.D. (Brighton)	Snr Lecturer	Environmental Microbiology
11.	OLADEJO BABAYEMI OLAWALE	B.Tech., M.Tech. (Akure), Ph.D. (Beijing)	Snr Lecturer	Medical Microbiology (Infectious Diseases & Immunology)
12.	OLUSOLA-MAKINDE OLUBUKOLA OLAYEMI	B.Tech., M.Tech., Ph.D. (Akure)	Snr Lecturer	Environmental Microbiology (Water, Air Quality & Wastewater Treatment)

9.9 SCHOOL OF LOGISTICS AND INNOVATION TECHNOLOGY

9.9.1 DEPARTMENT OF ENTREPRENEURSHIP (ENT)

POSTGRADUATE DIPLOMA (PGD) PROGRAMME IN ENTREPRENEURSHIP

NAME OF PROGRAMME: Post Graduate Diploma (PGD) in Entrepreneurship

PROGRAMME PHILOSOPHY

The PGD Programme in Entrepreneurship of the Federal University of Technology, Akure (FUTA) is targeted at developing in students a critical understanding of how entrepreneurial intention of establishing innovative ventures can be harnessed for economic development. The programme also aims at equipping students with management strategies for overall business strategy and development. The programme will enable the students the opportunity to acquire necessary skills in the effective management of both human and material resources at their disposal and make them competent to solve organisational problems both in public and private sectors. The overall purpose of this programme is to, through the knowledge of innovative entrepreneurship, impact social and economic development. This is with a view to making the graduates more relevant to both public and private sectors of the economy.

PROGRAMME OBJECTIVES

The objectives of the programme are to:

i. develop and strengthen capacity to generate entrepreneurship ideas, managerial and technical expertise to address socio-economic needs of both public and private organisations.

ii. increase the capacity of key stakeholders in enhancing standards of performance in the public and private sectors;

iii. expose students to theoretical and practical aspects of entrepreneurship as well as prepare them for research in entrepreneurship;

iv. enhance the capacity and knowledge of students for strong academic base in learning of entrepreneurship at higher levels; and

v. vdevelop the capacity of key decision-makers and personnel in the implementation of industrial policy for well-informed developments in entrepreneurship at national and global levels.

PROGRAMME JUSTIFICATION

The PGD programme is designed to accommodate candidate who are deficient in their first degree programme in entrepreneurship and to create an opportunity for candidates from other disciplines who aspire to acquire adequate educational training in entrepreneurship towards acquiring required knowledge in the field of study, innovative idea as well as management skills for development. The programme also aims at providing adequate and well-designed training in business creation, production, marketing and financing skills required to establish and successfully manage an enterprise.

ADMISSION REQUIREMENTS

An applicant for admission into the PGD programme shall be:

i. A graduate of FUTA and any other recognised University in Entrepreneurship, Management, Social Sciences, Sciences, Engineering, Agriculture or other relevant disciplines with a minimum of Third class;

ii. Holders of HND or equivalent qualification with a minimum of lower credit from a recognised Tertiary Institution; and

iii. Candidates with First degree or HND pass with professional qualifications such as Institute of Chartered Accountant of Nigeria (ICAN), Association of National Accountants of Nigeria (ANAN), Chartered Institute of Bankers of Nigeria (CIBN), Council of Registered Engineers of Nigeria (COREN).

PROGRAMME DURATION

The programme will be for a minimum of 12 months and maximum of 18 months on full time basis.

GRADUATION REQUIREMENTS

To qualify for the award of PGD in Entrepreneurship, students must pass a minimum of 36 course units. This is made up of 30 units of course work and 6 units of project.

COURSE OUTLINES

FIRST SESSION

	FIRST SEMESTER	
Course Code	**Course Title**	**L T P U**
ENT 701	Essentials of Entrepreneurship	2 0 0 2
ENT 703	Entrepreneurship Theories and Practices	2 0 0 2
ENT 705	Management of Small and Medium Scale Enterprises	2 0 0 2
ENT 707	Social Entrepreneurship	2 0 0 2
ENT 709	Entrepreneurial Finance	2 0 0 2
ENT 711	Quantitative Methods in Decision Making for Entrepreneurs	2 0 0 2
ENT 713	Entrepreneurial Law	2 0 0 2
Total		**14 Units**

	SECOND SEMESTER	
Course Code	**Course Title**	**L T P U**
ENT 702	Introduction to Technological Entrepreneurship	2 0 0 2
ENT 704	Creativity and Innovation	2 0 0 2
ENT 706	Entrepreneurial Marketing	2 0 0 2
ENT 708	Research Methodology	2 0 0 2
ENT 710	Production and Operations Management	2 0 0 2
ENT 712	Strategic Thinking, Problem Solving and Negotiation Skills in Entrepreneurship	2 0 0 2
ENT 714	International Entrepreneurship	2 0 0 2
Total		**14 Units**

	SECOND SESSION	
	FIRST SEMESTER	
Course Code	**Course Title**	**L T P U**
ENT 715	Seminar Presentations	0 0 6 2
ENT 799	Research Project	0 0 18 6
Total		**8 Units**

COURSE SYNOPSES

ENT 701: Essentials of Entrepreneurship (2 Units)

Meaning of entrepreneurship and intrapreneurship, types of entrepreneurship, entrepreneur, types of entrepreneurs, personal entrepreneurial characteristics (PECs), roles of entrepreneur, factors influencing new venture formation, management of existing business, entrepreneurial education, importance of entrepreneurship, forms of business organisation, Preparation of feasibility study and business plan. Characteristics of entrepreneurship environment in Nigeria. Role of government in entrepreneurial development. Challenges of entrepreneurship in Nigeria.

ENT 702: Introduction to Technological Entrepreneurship (2 Units)

Meaning of technological entrepreneurship, nature of technological entrepreneurship as well as the difference between technological entrepreneurship and general entrepreneurship. Sources of technological entrepreneurship: research and development (R&D), creativity, innovation. Technological entrepreneurship and economic development. Government supports for technological entrepreneurship in Nigeria. Innovation: Nature, type, sources, challenges, roles of innovation to economic development. National systems of innovation: actors, interactions, importance.

ENT 703: Entrepreneuship Theories and Practices (2 Units)

Concepts of entrepreneurship theories. Classifications

of theories of entrepreneurship: economic entrepreneurship theory, psychological entrepreneurship theory, sociological entrepreneurship theory, opportunity-based entrepreneurship theory, resource-based entrepreneurship theory; and X- Efficiency theory. Practices of entrepreneurship in selected developed economies such as USA, China, Japan, and Germany. Practices of entrepreneurship in selected emerging economies such as South Korea, Singapore, and India. Practices of entrepreneurship in Nigeria. Effects of entrepreneurship theories to national development.

ENT 704: Creativity and Innovations (2 Units)

Creativity defined. The concept of innovation. The sources of creativity and innovations. Techniques that stimulate creativity and innovation in workplaces. Components of creativity. Nature of innovations: incremental, radical and revolutionary. Types of Innovations: Product, process, marketing and organisational. Innovation and Entrepreneurship. Disruptive innovation.Technological Innovation. The national systems of innovations: Actors and roles. Indigenous Innovations. Human capital and innovations. Diffusion of Innovations. Challenges of innovation in Nigeria.

ENT 705: Small and Medium Scale Enterprises (2 Units)

Starting of new Small and Medium Enterprises (SMEs) as well as the knowledge of managing existing enterprises. Students will also be exposed to how to identify and analyse problems of SMEs; methods of financing SMEs; how to raise business funds; types of SMEs; issues in SMEs: production, personnel, organisation and control, marketing and development strategies.

ENT 706: Entrepreneurial Marketing (2 Units)

Marketing concept, marketing process, product life cycle, marketing mix, pricing strategy as well as marketing problems. Marketing research: techniques in marketing survey, marketing research design, marketing research instruments, data and presentation of marketing research results. Marketing promotion strategies: enterprise promotion, methods of marketing promotion, elements of marketing promotion mix, e-business enterprise, thoughts on marketing promotion and communications, the communication process, integrated marketing communication, innovation in enterprise promotions, generic communications process, direct and online marketing as promotion strategy.

ENT 707: Social Entrepreneurship (2 Units)

The meaning of Social Entrepreneurship. History of Social Entrepreneurship. Differences between traditional business entrepreneurs and social entrepreneurs. The characteristics of social entrepreneurs. Examples of old and contemporary Social Entrepreneurs. Roles of government in Social entrepreneurship. Roles of non-governmental organisations (NGOs) and religious organisations in social entrepreneurship. Social entrepreneurship in Nigeria.

ENT 708: Research Methodology (2 Units)

Introduction to research methodology. Project/Thesis writing, selection of topics, problem identification, objectives setting, literature review, research plan, research design, types of variables, validity and reliability, methods of data collection, participatory techniques, interview, questionnaires etc. Simple statistics, mean, mode, median, probability theory, hypothesis testing, linear and multiple regression analysis, analyses of variance. Attitudinal measurement; conclusion and recommendations; referencing; presentation of report.

ENT 709: Entrepreneurial Finance (2 Units)

Business finance: sources of capital for entrepreneurial activities: venture capital, Business angels, asset lease, factoring, crowding funding, crowd investing, traditional sources; financial planning in entrepreneurship, financial roles of an entrepreneur, methods of evaluating capital investment, financial decisions of a firm. The course will also expose the students to preparation and interpretation of financial statements, profit and loss account, cost accounting, record keeping, depreciation of fixed assets, sources and books of accounts, management accounting. Entrepreneurship investment decisions, concept of investment, money markets, capital markets, stock market index, the institutional investors, dividend theory.

ENT 710: Production and Operations Management (2 Units)

Product design and development; plant and machinery acquisition and replacement decision; scheduling, planning and control of production and inventory; impact of advanced manufacturing technology, total quality management; material requirement planning, just-n-time processing. Process Flow Structures, A comparison of the job shop,

batch process, assembly line and continuous flow process structures, Process Analysis, How to analyze business processes, process flow diagrams, performance measures, Little's law; Linear Programming, Gantt charts, Critical Path Method, Time – Cost Trade – offs, Types of project costs and the trade – offs between project cost completion time.

ENT 711: Quantitative Methods in Decision-making for Entrepreneurs (2 Units)

Introduction to organisation theory, decision theory under certainty, uncertainty, risk, and conflict; linear programming, integer programming, goal programming, dynamic programming, input-output models; Markov chains, inventory models; queueing theory, simulation models, network analysis and transportation models.

ENT 712: Strategic Thinking, Problem Solving and Negotiation Skills in Entrepreneurship (2 Units)

Definition of strategy, entrepreneurial strategic thinking. Importance of entrepreneurial strategic thinking. Definition of problem solving in entrepreneurship. Steps involved in entrepreneurship problem solving. Importance of problem solving to Entrepreneurs. Definition of negotiation. Why negotiate? Negotiation process. Importance of negotiation. Importance of negotiation skills.

ENT 713: Entrepreneurial Law (2 Units)

Business organisation and business formation, elements of valid contracts, discharge of contract and remedies for breach of contract. Guaranty and suretyship, commercial transaction – sales and rights of parties, credit card transactions, secured transactions, law of intellectual property, technology law and law of electronic commerce, restrictive covenants designed to protect proprietary rights and information, product development and product liability, competition law, advertising rules and passing off.

ENT 714 International Entrepreneurship (2 Units)

The nature and scope of International Business, sources of information on foreign markets, appraisal of foreign environments, taxation of international income regulation of monopolies, conflict management in international business, international monetary system, foreign exchange control system, sources of internal finance, pricing policies.

ENT 715 Seminar Presentation (2 Units)

Presentation of a seminar paper. Each student's seminar topic must be related to the student's final year project and shall be assessed by oral presentation and defense.

ENT 799 Research Project (6 Units)

The research project will involve individual student conducting practical investigation into project that is entrepreneurship focused under the guidance of a supervisor in the field of study.

MASTER OF TECHNOLOGY (M. Tech) PROGRAMME IN ENTREPRENEURSHIP

NAME OF PROGRAMME: Master of Technology in Entrepreneurship (M. Tech. ENT)

PROGRAMME PHILOSOPHY

The Master of Technology (M. Tech.) Programme in Entrepreneurship of the Federal University of Technology, Akure (FUTA) is targeted at graduates with passion for entrepreneurial development as well as venture creation and innovation. This programme is also designed for candidates who aspire to have a successful career in both the private and public sectors with entrepreneurial mindset. The programme also aims at training managers with entrepreneurial intentions of starting innovative ventures and producing policy makers as well as employers of labour in various industries. The programme will develop in students the capability to impart entrepreneurship knowledge to others in Nigeria.

PROGRAMME OBJECTIVES

The objectives of the programme are to:

i. provide strong academic base and adequate knowledge in students for teaching and research in entrepreneurship;
ii. create entrepreneurial mindset and spirit in students;
iii. prepare students for effective entrepreneurship policy formulation for national development;
iv. impart into the students entrepreneurial skills and application of techniques for achieving organisational

goals and increasing economic productivity as well as social welfare;
v. prepare students for administrative and managerial positions in both private and public sectors;
vi. impart core concepts, theories, principles and practices of entrepreneurship into the students; and
vii. motivate students for self-employment and job-creation.

PROGRAMME JUSTIFICATION

The economic growth, sustainable development and global competitiveness of any economy depend on its innovative capabilities. Moreover, it is generally believed that graduates of various disciplines with entrepreneurial mindset and skills for innovation and creativity can contribute meaningfully to the socio-economic development of any nation. This is particularly relevant to Nigeria where there are human and natural resources in abundance with vast opportunities for rapid economic development of the nation. Consequently, the M. Tech. programme in Entrepreneurship of FUTA is designed to combine theoretical knowledge and practical skills in entrepreneurship for strategic decision-making, innovations as well as management of technology for development. The programme also aims at providing adequate and well-designed training on the principles of business practices as well as the essential managerial, marketing and financing skills required to establish and successfully run an enterprise.

ADMISSION REQUIREMENTS

To be eligible for admission, a candidate must possess any of the following qualifications:

i. A graduate of FUTA or any other recognised University in Entrepreneurship, Management, Social Sciences or other relevant disciplines with a minimum of Second Class (Lower Division).
ii. Holders of Postgraduate Diploma with a minimum of Upper Credit in Entrepreneurship, Management and Social Sciences or other relevant disciplines.

PROGRAMME DURATION

The programme will be for a minimum of 18 months and a maximum of 24 months.

GRADUATION REQUIREMENTS

A candidate is expected to pass a total of 55 credit units to qualify for the award of M.Tech in Entrepreneurship. This is made up of 43 credit units of course work and 12 credit units of supervised dissertation.

COURSE OUTLINE

FIRST SESSION

FIRST SEMESTER

Course Code	Course Title	L	T	P	U
ENT 801	Fundamentals of Entrepreneurship	2	0	0	2
ENT 803	Creativity and Innovation in Entrepreneurship	2	1	0	3
ENT 805	Theories of Entrepreneurship	2	1	0	3
ENT 807	Entrepreneurial Marketing	2	0	0	2
ENT 809	Venture Creation and Growth	2	0	0	2
ENT 811	Statistics	2	0	0	2
ENT 813	Entrepreneurial Finance	2	0	0	2
	Elective Course	2	0	0	2
Total		**18 Units**			

Elective Courses

ENT 815	E-Enterprise	2	0	0	2
ENT 817	Risk Management in Entrepreneurship	2	0	0	2
ENT 819	Human Resource Management	2	0	0	2

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
ENT 802	Technological Entrepreneurship	2	1	0	3
ENT 804	Social Entrepreneurship	2	1	0	3
ENT 806	Management of Small and Medium Scale Enterprises	2	0	0	2
ENT 808	Production and Operations Management	2	1	0	3
ENT 810	Advanced Strategic Thinking, Problem Solving and Negotiation Skills in Entrepreneurship	2	0	0	2
ENT812	Experiential Industrial Skill	0	0	9	3

	Building	
ENT 814	Entrepreneurial Law	2 0 0 2
ENT 816	Research Methodology	2 1 0 3
Elective		2 0 0 2
Total		**23 Units**

Elective Courses

ENT 818	Family Business and Succession Planning	2 0 0 2
ENT 820	Gender Issues in Entrepreneurship	2 0 0 2
ENT 822	International Entrepreneurship	2 0 0 2
	SECOND SESSION	
	FIRST SEMESTER	
ENT 821	Seminar Presentation	0 0 6 2
ENT 899	Research Dissertation	0 0 36 12
Total		**14 Units**

COURSE SYNOPSES

ENT 801 Fundamentals of Entrepreneurship (2 Units)

Fundamental of Entrepreneurship and new venture creation. Managers and Intrapreneurship with distinctive features. Importance of Entrepreneurship. History of Entrepreneurship; Entrepreneurial process; Entrepreneurial mindset. Origin of Entrepreneurship in Nigeria. Entrepreneurship environment in Nigeria.

ENT 802 Technological Entrepreneurship (3 Units)

Science and Technology in Entrepreneurship. The emergence of new technologies in global market for value creation and enterprise development. Exploration of innovative enterprises and new ventures in the field of science and technology. Develop knowledge on the commercialisation pathways for technological innovations and acquisition of the capabilities for turning idea into venture success. Concept of intellectual property. Types of intellectual property. Sources of intellectual property. Roles of intellectual property on sustainable economic development.

ENT 803 Creativity and Innovation in Entrepreneurship (3 Units)

Innovation: types of innovation; framework for learning innovation skills; market-driven innovations; sources of innovations; Nature of innovations: incremental, radical and revolutionary, strategies of innovation; Concept of national innovation systems (NIS): actors of NIS, interactions of the actors of NIS. Indigenous Innovations. Human capital and innovations. Diffusion of Innovations. Challenges of innovation in Nigeria. Innovation in Entrepreneurship. Disruptive innovation. Technological Innovation. The concept of Creativity. The sources of creativity. Techniques that stimulate creativity in workplaces. Components of creativity. Creativity and Entrepreneurship.

ENT 804 Advanced Social Entrepreneurship (3 Units)

History of social entrepreneurship as well as the practices and strategies of old and contemporary social entrepreneurship. The characteristics of social entrepreneurs. Role of social entrepreneurship in sustainable national development. Roles of selected social entrepreneurs. Youth social entrepreneurship.
The role of government in social entrepreneurship. The involvement of non-governmental organisations (NGOs) and religious organisations in social entrepreneurship. Nexus between social entrepreneurship and empowerment. The practice of social entrepreneurship in some selected African, South American, North American, Asian and European countries.

ENT 805 Theories of Entrepreneurship (3 Units)

Theories of Entrepreneurship from mercantilists' perspectives: Thomas Mun, William Petty. The physiocrats' perspectives: Richard Cantillon, Francois Quesnay. The Classists' perspectives: Adam Smith, David Ricardo, Jean Baptiste Say. The neo-classics perspectives: Carl Manger, Alfred Marshall, Leon Walras, Joseph Schumpeter, Wilfredo Pareto. The Keynesians' perspectives: the theory of transformation of new knowledge in Entrepreneurship: Paul Romer, Robert Lucas and Robert Solow. Entrepreneurial theories of Israel Kirzner, Sander Wennekers, Roy Thurik and Douglas North. History of Entrepreneurship in Britain; History of Entrepreneurship in France; History of Entrepreneurship in Germany; History of Entrepreneurship in USA; History of Entrepreneurship in Japan; History of Entrepreneurship in China; History of Entrepreneurshipin Ghana; History of Entrepreneurship
in Nigeria.

ENT 806 Management of Small and Medium Scale Enterprises (2 Units)

New small and medium scale enterprises (SMEs) as well as the knowledge of managing existing enterprises. Students will also be exposed to how to identify and analyse problems of SMEs; methods of financing SMEs; how to raise business funds; prepare business plan; issues in SMEs: production, personnel, organisation and control, marketing and development strategies.

ENT 807 Entrepreneurial Marketing (2 Units)

Entrepreneurship marketing and promotion. Challenges in Entrepreneurship Marketing Channels of product distribution.Entrepreneurship marketing research and decision making. Marketing research technique. Value and cost of marketing research information. Sources of secondary data for entrepreneurship marketing research. Survey research. Questionnaire design for entrepreneurship research.Integrated marketing promotion strategy. Consumer behaviour and marketing promotions.Environmental factors influencing Entrepreneurship in Nigeria. Types of environmental factors.

ENT 808 Production and Operations Management (3 Units)

New product development (NPD) process in manufacturing. Scheduling Operations and Services. Operational planning and control. Aggregate planning methods: seasonal production planning and workforce planning. Integration of planning and scheduling level. Waiting lines: management of waiting lines. Quality: management of quality, quality control. Inventory management: nature and importance of inventories, economic order models. Linear programming. The transport models.

ENT 809 Venture Creation and Growth (2 Units)

Concept of venture creation. Process in Venture Creation: Generation of venture Ideas/Opportunity recognition, Screening of venture ideas. Venturedevelopment and testing, venture marketing strategy, venture product development, venture analysis, execution of a venture idea. Factors motivating venture creation. Risks in new venture creation. Entrepreneurship Process: Opportunity Recognition/Discovery (Potential Entrepreneur), Opportunity Preparation/Developing a Business Plan (Nascent Entrepreneur), Opportunity Exploitation/ Ascertaining the Resource needs/Resourcing (New Entrepreneur/Baby Business), Value Creation/Harvesting and Succeeding (Established Entrepreneur). Innovation & Emerging Technology in new venture. Financing new technology ventures. New venture Planning. New venture promotion. Development of entrepreneurial skills and start-up process: idea selection to venture formation. Effects of entrepreneurial venture creation on sustainable development. Theories of Entrepreneurial Success. New venture growth. Preparation of Feasibility study and business plan.

ENT 810 Advanced Strategic Thinking, Problem Solving and Negotiation Skills in Entrepreneurship (2 Units)

Definition of entrepreneurial strategic thinking. Importance of entrepreneurial strategic thinking. The difference between entrepreneurial strategic thinking and strategic planning. The discipline of entrepreneurial strategic thinking. Traps of entrepreneurial strategic thinking. Definition of problem solving in entrepreneurship.

The steps involved in entrepreneurship problem solving. Entrepreneurial problem solving models. Importance of problem solving to enterprises. Strategies to problem solving in entrepreneurship. Definition of negotiation. Why negotiate? Negotiation process. Importance of Negotiation. Types of negotiation skills. Importance of negotiation skills. Necessary skills for effective negotiation.

ENT 811 Statistics (2 Units)

Elementary sampling theory, Sample and random numbers, sampling distribution of means, proportions, differences, and sums, statistical estimation theory, print and interval estimates of population parameters, statistical decision theory, descriptive and inferential statistics, test of hypothesis, levels of significance, type I and type II errors, two tailed and one tailed tests, Students distribution, Chi – square distribution and tests, Curve fitting and methods of least squares. Analysis of time series data, index numbers, correlation analysis, regression analysis, interpretation of results. Standard error, reliability and confidence levels, analysis of variance (ANOVA). Application of software in statistics; SPSS, E-View and STATA.

ENT 812 Experiential Industrial Skill Building (3 Units)

Practical training and industrial study tours. Students will be grouped and assigned to specific enterprises based on individual students' preference. The students 'group is expected to spend two hours weekly in the chosen workshop or the enterprise. The course facilitator will provide general guidance while the industrial facilitator provides skills development, acquisition and mentoring.

The students would also be expected to spend three month in a firm of his/her choice to gather practical experience. A student is expected to present a report and make oral presentation for grading to the lecturers in the department at the end of the industrial experience.

ENT 813 Entrepreneurial Finance (2 Units)

The nature and functions of accounting; the nature of business accounting and double entry; basic auditing; forms of accounting analysis, methods of financial accounts allocation in new and existing ventures. Sources of entrepreneurial finance, Types of entrepreneurial finance: venture capital, business angels, asset lease, factoring, crowdfunding, crowd investing, trade credits, cooperatives, traditional sources; entrepreneurialz financial planning; the financial statements; the stock market; analysis of financial statement; public financial management, international funding organisations.

ENT 814 Entrepreneurial Law (2 Units)
Business organisation and business formation. Elements of valid contracts, discharge of contract and remedies for breach of contract. Guaranty and suretyship. Commercial transactions – sales and rights of parties, credit card transactions. Secured transactions. Law of intellectual property, technology law and law of Electronic Commerce. Restrictive covenants designed to protect proprietary rights and information. Product development and product liability. Competition law. Advertising rules. Law relating taxation of business organisations. Securities regulation, mergers and acquisitions, bankruptcy and insolvency. International business transactions. Contract drafting and negotiations. Settlement of commercial disputes.

ENT 815 E-Enterprise (2 Units)

Overview of E-Enterprise. Importance of E-Enterprise. E-Enterprise versus Conventional Enterprise. Technology Infrastructure in E-Enterprise. The Internet and World Wide Web applications on E-Enterprise. Consumer Based Strategies on the Internet. Internet Advertisement. Achieving Competitive advantage using E-adverts. Business Strategies for E-Enterprise. Selling in the Web. Marketing on the Web. Online Auctions. Payment System for E-Business. E-payment in E-Enterprise: ATM, Debit and Credit Cards. Measuring effectiveness of E-Business.
Hazardous activities in E-Business. E-Business in Nigeria. The Prospects of E-Business in Nigeria. Challenges of E-Enterprise in Nigeria.

ENT 816 Research Methodology (3 Units)

Introduction to research methodology. Research process, Research design, sampling techniques, sources of data. Sampling techniques: probability and non-probability sampling techniques, measurement of variables in research. Validity and Reliability. Tests in research. Data analyses techniques: formulation and test of hypothesis, Parametric and non-parametric test tools. Research report writing styles; referencing styles. Software for data analyses: SPSS, E-views, EXCEL, SAS.

ENT 817 Risk Management in Entrepreneurship (2 Units)
Concept of risk and uncertainty. Attitudes to risks. Types of risk: Financial, Management, Market, Technical, Legal, Political, Environmental. Risk management: decision making under uncertainty; attitude towards risk taking; interactions of achievement motivation and risk taking; risk control and reduction. Risk Management Assessment. Risk Transfer: Non-insurance methods (contract conditions, sub-contracting). Insurance Industry in Nigeria. Risk Management techniques in Nigeria insurance industry. Risk Management Index (RMI). Risk indicators in a business.

ENT 818 Family Business and Succession Planning (2 Units)

The concept of family business: definitions of family business, family in the African and Nigerian settings. Assumptions about family business; challenges of family owned businesses; cultural contexts of family business: cultural values in Nigeria. Merit and demerit of family business, family roles and relationships, the need for good management in the family firm, strategies for coping with roles/relationship issues in family owned businesses (family retreats, family councils, and family business constitution; ownership transfer and succession in family business: the process of leadership succession, stages of succession process in a family, conditions favouring successful leadership succession in a family firm, transfer of ownership. Family Business Succession and the Continuity of Entrepreneurial Venture.

ENT 819 Human Resource Management (2 Units)

Methods of acquiring management skills. Students are also exposed to the knowledge of consultancy skills; personnel policies; human resource management process; human capital development; talent management;

new approaches to delivery learning and training; performance management; competency-based human resource management; reward systems and management; employees' relations; stress management; practical application of organisational behaviour; measurement of organisational success; change management; consultancy in small scale businesses; corporate entrepreneurship; social entrepreneurship; gender issues in entrepreneurship; leadership and corporate governance.

ENT 820 Gender Issues in Entrepreneurship (2 Units)

Gender as a factor in entrepreneurship discourse. Theories of Gender. Gender theories and female entrepreneurship; importance of female entrepreneurship;
characteristics of female entrepreneurs; motivation factors for female entrepreneurs; patterns of female-owned/managed businesses; barriers to female entrepreneurship; government support and activities for female entrepreneurship in Nigeria; comparative studies of female entrepreneurship issues across countries of the world.

ENT 821 Seminar Presentations (2 Units)

Candidates will be expected to present seminar paper on a chosen topic related to entrepreneurship. They will be graded by lecturers in the School.

ENT 822 International Entrepreneurship (2 Units)

The nature and scope of International entrepreneurship, sources of information on foreign markets, appraisal of foreign environments, taxation of international income regulation of monopolies, conflict management in international entrepreneurship, monetary system, foreign exchange control system, sources of internal finance, pricing policies in international entrepreneurship.

ENT 899 Dissertation (12 Units)

The research dissertation will involve individual student conducting practical investigation into project that is entrepreneurial under the guidance of a supervisor in the field of research.

MASTER/DOCTOR OF PHILOSOPHY (M.Phil./Ph.D.) ROGRAMME IN ENTREPRENEURSHIP

NAME OF PROGRAMME

Master/Doctor of Philosophy in Entrepreneurship (M.Phil. /Ph.D. ENT)

PROGRAMME PHILOSOPHY

The Master of Philosophy/Doctoral (M.Phil./Ph.D.) Programme in Entrepreneurship (ENT) prepares students aspiring towards doctoral degree to conduct and publish scholarly research in the fields of Entrepreneurship. The purpose of the programme is to place its graduates into academic positions at leading research-oriented Universities in Nigeria and abroad. The students' learning experience is enhanced through active participation in research seminars, joint research projects in the field of entrepreneurship technology, and participation in academic conferences. Students are trained in effective teaching and how to conduct impactful research. They are strongly encouraged to publish their work in top- academic journals before they enter the job market. The M.Phil./Ph.D. programme aims to train professional managers with entrepreneurial intention of starting innovative ventures.

It also aims at producing high caliber policy makers in various industries as well as employers of labour. The programme is also targeted at graduates with varied backgrounds but with passion for entrepreneurial development, venture creation and technological innovation.

PROGRAMME OBJECTIVES

The objectives of the M.Phil./Ph.D. programme in Entrepreneurship are to:

i. offer adequate knowledge and strong academic base in students for teaching and research in entrepreneurship and innovation management;
ii. build in students the knowledge and practice of entrepreneurship through training, research and development;
iii. impart the knowledge of the application/techniques of management for solving enterprise/business problems through technological innovation and creativity;
iv. inculcate the knowledge of enterprise policy formulation necessary for sustainable national growth and development;
v. acquaint enterprise professionals with recent management techniques in industrial sectors and equip them, with the ability to apply the principles;

and theory of entrepreneurship and innovation for efficient enterprise systems;

vi. expose postgraduate students to both the theoretical and practical aspects of entrepreneurship studies for advanced research in the industrial and productive sectors; and

vii. provide a solid intellectual and methodological foundations for M.Phil./Ph.D. candidates to proceed to Doctor of Philosophy in Entrepreneurship (Ph.D. ENT).

PROGRAMME JUSTIFICATION

The M.Phil./Ph.D. programme is aimed at deepening technological entrepreneurial attitude of learners and training professionals who are desirous of obtaining qualifications in entrepreneurship. The programme is also aimed at encouraging and promoting the knowledge and creation of innovative enterprises as well as producing large pool of technological entrepreneurs for marketable products and services to enhance global competitiveness.

The M.Phil./Ph.D. programme in Entrepreneurship is also designed to address the problem of inadequate professionals of Entrepreneurship in Nigeria and bridge the gap in the M.Tech./M.Sc. programme. The postgraduate programme will produce qualified Entrepreneurship professionals who will occupy management positions and engage in policy formulation and implementation as well as professional academics in Entrepreneurship. The programme also aims at providing balanced and well-designed training in the principles of business practices as well as the essential managerial, marketing and financing skills needed to start-up and successfully run an enterprise. The curriculum provides a combination of theoretical knowledge and practical skills, focusing on entrepreneurial and key skills in strategic decisions and technological innovations.

ADMISSION REQUIREMENTS

To be eligible for admission, a candidate must possess any of the following qualifications:

i. A Master degree in Entrepreneurship, Management or Social Sciences with a CGPA between 3.00 and 3.49 on a 5.00-point scale or below 60% (but not less than 55%) from FUTA or any other recognized University;

ii. All applications for admission shall be subject to Postgraduate School's regulation and carrying capacities.

PROGRAMME DURATION

i. The duration for M.Phil. programme shall be minimum of twelve (12) months and maximum of eighteen (18) months on full time basis and minimum of eighteen (18) months and maximum of twenty-four (24) months on full time basis.

ii. The duration for the Ph.D. programme shall be minimum of twenty-four (24) months and maximum of thirty-six (36) months on full time basis and minimum of thirty-six (36) months and maximum of forty-eight (48) months on part time basis.

iii. Any candidate who fails to meet the minimum requirement for conversion to Ph.D. shall terminate the programme at the M.Phil. level.

REQUIREMENTS FOR CONVERSION FROM M.Phil./Ph.D. to Ph.D. PROGRAMME

A candidate on M.Phil./Ph.D. programme may convert to Ph.D. programme if he/she:

i. successfully presents at least two seminars (proposal and progress);

ii. prepares and submits to the Postgraduate School through the Department, a research plan considered suitable for pursuing Ph.D. Degree;

iii. presents a detailed report of research-work done up to the time of seeking conversion and submitted to the School of Postgraduate Studies any relevant published and unpublished materials that can be assessed by the Department;

iv. completes all courses with a CGPA of not less than 3.5 or 60% aggregate score in the M.Phil/Ph.D programme;

v. passes an oral transfer examination to be conducted by the panel drawn from his/her Department and other relevant Departments in the University on the subject of the research and topics relevant to Entrepreneurship;

vi. fulfills all the conditions as approved by the University Senate;

vii. obtains and completes Ph.D. conversion form as appropriate.

COURSE OUTLINE

	FIRST SESSION				
First Semester	**Course Title**	**L**	**T**	**P**	**U**
Course Code					
ENT 881	Fundamental of Entrepreneurship	2	0	0	2
ENT 883	Theories of Entrepreneurship	2	1	0	3
ENT 885	Statistics	2	0	0	2
Total					**7**

L=Lecture, T=Tutorial, P=Practical, U=Units

COURSE OUTLINE

	FIRST SESSION				
Second Semester	**Course Title**	**L**	**T**	**P**	**U**
Course Code					
ENT 882	Management of Small and Medium Scale Enterprises	3	1	0	3
ENT 884	Seminar Presentations	0	0	9	3
ENT 886	Research Methodology	2	1	0	3
ENT 889	Ph.D Research Conversion Thesis Proposal	0	0	18	6
Total					**15**

L=Lecture, T=Tutorial, P=Practical, U=Units

COURSE SYNOPSES

ENT 881 Fundamental of Entrepreneurship 2 Units

Fundamental of Entrepreneurship and new venture creation. Managers and Intrapreneurship with distinctive features. Importance of Entrepreneurship. History of Entrepreneurship; Entrepreneurial process; Entrepreneurial mindset. Origin of Entrepreneurship in Nigeria. Entrepreneurship environment in Nigeria. Definitions of creativity and innovation; theory of innovation; nature and types of innovation; sources of innovative ideas; why business innovative; innovation policies at national and global levels.

ENT 882 Management of Small and Medium Scale Enterprises 3 Units

Concept of small-scale enterprises. Classifications of small-scale enterprises. Small small-scale enterprises - characteristics, importance, challenges, Fiscal incentives and supports for small business enterprises, Legal issues in small business enterprises, enabling environment for small business enterprises. Technology application in small business enterprises. Capital formation in small business enterprises, Accounting for small business enterprises. Innovations in small business enterprises. Medium-scale enterprises – characteristics, importance, challenges, marketing strategies in medium-scale enterprises. Innovations in medium-scale enterprises. Sources of financing for medium-scale enterprises. Management strategies in medium-scale enterprises. Policy issues in small and medium-scale enterprises in Nigeria. Cases of successful small and medium scale enterprises (SMEs).

ENT 883 Theories of Entrepreneurship 3 Units

Philosophies of Entrepreneurship. The Classists' philosophies: Adam Smith, David Ricardo, Jean Baptiste Say. The neo-classists' philosophies: Joseph Schumpeter, Alfred Marshall, Wilfredo Pareto, Carl Manger, and Leon Walras. The Mercantilists' philosophies: Thomas Mun, William Petty. The physiocrats' philosophies: Richard Cantillon, Francois Quesnay. The Keynesians' perspectives: the theory of transformationof new knowledge in Entrepreneurship: Paul Romer, Robert Lucas and Robert Solow. History of Entrepreneurship in Britain; History of Entrepreneurship in USA; History of Entrepreneurship in France; History of Entrepreneurship in Germany; History of Entrepreneurship in Japan; History of Entrepreneurship in China; History of Entrepreneurshipin selected African nations; History of Entrepreneurship in Nigeria.

ENT 884 Seminar Presentations 3 Units

Each student is expected to present a seminar paper. Each student's seminar topic must be related to the student's final year project and shall be assessed by oral presentation and defense.

ENT 885 Statistics 2 Units

Elementary sampling theory, Sample and random numbers, sampling distribution of means, proportions, differences, and sums, statistical estimation theory, print and interval estimates of population parameters,

statistical decision theory, descriptive and inferential statistics, test of hypothesis, levels of significance, type I and type II errors, two tailed and one tailed tests, Students distribution, Chi – square distribution and tests, Curve fitting and methods of least squares. Analysis of time series data, index numbers, correlation analysis, regression analysis, interpretation of results. Standard error, reliability and confidence levels, analysis of variance (ANOVA). Application of software in statistics; SPSS, E-View and STATA.

ENT 886 Research Methodology 3 Units

Definition of Research. The scientific research process. Quantitative Research Methods, Qualitative Research Methods. Determination of sample design: Probability and non-probability sampling techniques. Development and test of working hypotheses. Validity and reliability tests in research. Data acquisition and processing: Statistical techniques in data analysis. Software for data analyses: SPSS, E-views, EXCEL, SAS. Writing and presenting thesis report. Techniques for writing standard academic papers for publication

ENT 889 Ph.D Research Conversion Thesis Proposal 6 Units

Candidates will be expected to carry out in depth researc h on any aspect of entrepreneurship and write a thesis on an approved topic and pass a conversion oral examinati on on same according to the rules and regulations of Pos tgraduate school under the direction of departmental sup ervisor. This should consist of an independent work with sound theoretical and investigative approach in a chosen area of entrepreneurship leading to an original contribution to knowledge.

DOCTOR OF PHILOSOPHY (Ph.D.) PROGRAMME IN ENTREPRENEURSHIP

NAME OF PROGRAMME

Doctor of Philosophy in Entrepreneurship (Ph.D. ENT)

AVAILABLE OPTIONS/SPECIALISATION

i. Technology Entrepreneurship and Innovation
ii. Entrepreneurial Finance
iii. Social Entrepreneurship

PHILOSOPHY OF THE PROGRAMME

The Doctor of Philosophy (Ph.D.) Programme in Entrepreneurship of the Federal University of Technology, Akure is to produce graduates that are resourceful and have passion for, *inter alia,* venture creation and innovation. The programme is designed to train individuals who aspire to build a successful career in Entrepreneurship. The programme will also develop professionals who can effectively impart entrepreneurial knowledge within the tertiary institutions, formulate and implement entrepreneurship policies at national and international levels.

OBJECTIVES OF THE PROGRAMME

The objectives of the programme are to:

i. provide strong academic base and adequate knowledge in students for teaching and research in entrepreneurship;
ii. impart core concepts, theories, principles and practices of entrepreneurship in the students;
iii. groom students to develop and launch distinctive, marketable ventures that address societal needs;
iv. develop students' capacity for idea generation, opportunity recognition, resource acquisition and entrepreneurial management; and
v. equip students with skills and competences vital to the success of businesses or organisations.

JUSTIFICATION FOR THE PROGRAMME

The Ph.D. programme in Entrepreneurship is designed to build the capacities of candidates in Entrepreneurship from various disciplines with entrepreneurial knowledge, mindsets and skills for innovation and creativity for sustainable development. The programme also aims at providing adequate and well-designed training in business creation, practices as well as the essential managerial, marketing and financing skills required to establish and successfully manage an enterprise. The syllabus provides a combination of theoretical knowledge and practical skills, focusing on entrepreneurial skills for strategic decision, innovations and creativity.

ADMISSION REQUIREMENTS

To be eligible for admission, a candidate must possess any of the following qualification:

i. A Master of Technology (M. Tech.) or Master of Science (M.Sc.) Degree in Entrepreneurship,

Management, Social Sciences and other relevant disciplines in Agriculture, Sciences, Engineering from FUTA or any other recognised university with a minimum CGPA of 3.50 on a 5.00-point scale or weighted average of 60%.

ii. An M.Phil. Degree in Entrepreneurship, Management, Social Sciences and relevant disciplines in Agriculture, Sciences, Engineering from FUTA or any other recognised university with a minimum CGPA of 3.50 on a 5.00-point scale or weighted average of 60%.

PROGRAMME DURATION

The duration for Ph.D. programme is:

i. minimum of 36 months and maximum of 48 months on full time basis.
ii. minimum of 48 months and maximum of 60 months on part-time basis.

GRADUATION REQUIREMENTS FOR THE PROGRAMME

To qualify for the award of Ph.D. in Entrepreneurship a candidate must;

i. have passed a total of 12 credit units of supervised Thesis.
ii. present proof of a minimum of 2 Journal publications and any other requirements as may be specified by the School of Postgraduate Studies from time to time.

COURSE OUTLINE

COURSE CODE	COURSE TITLE	L	T	P	U
ENT 999	Thesis	0	0	36	12
Total					**12**

L= Lecture, T= Tutorial, P= Practical, U= Units

COURSE SYNOPSIS

ENT 999 Thesis 12 units

The thesis will involve individual student conducting practical investigation into entrepreneurship-based research under the guidance of supervisors in the field of research as approved by the postgraduate school.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF ENTREPRENEURSHIP

S/N	NAME	QUALIFICATION	STATUS	AREA OF SPECIALISATION
1.	Olowofeso, E.	B. Tech., M. Tech., Ph.D. (Akure)	Senior Lecturer	Entrepreneurship and Innovation Management
2	Obamuyi, T. M.	B.Sc. (Ado-Ekiti), M.Sc. (Lagos), MBA, Ph.D. (Akure)	Professor	Finance and Entrepreneurship
5.	Simon-Oke, O. O.	B.Sc., M.Sc., Ph.D. (Ado-Ekiti)	Professor	Industrial Economics
6.	Olowolaju, P. S.	B.Sc., M.Sc., Ph.D. (Ife)	Professor	Entrepreneurial Finance
7.	Fakokunde, T. O.	B.Sc. (Lagos), MBA (Akure), M.Sc., Ph.D. (Ilorin)	Professor	Business Innovation, Entrepreneurship and Management
8.	Olowokere, E. N.	LL.B. (Ado-Ekiti), B.L., LL.M. (Ibadan), Ph.D. (Ilorin)	Professor	E-Commerce Law and Consumer Protection
9.	Jesuleye, O. A.	B.Sc. (Maiduguri), M.Sc., Ph.D. (Ife)	Professor	Technology Management
10.	Ajayi, M. O.	B. A. Ed. (Benin), MPA, M.Phil. (Ife), Ph.D. (Akure)	Professor	Enterprise Strategic Management
11.	Dada, A. D.	B. Agric. (Abeokuta), M.Sc. (Ibadan), M.Sc. Ph.D. (Ile-Ife)	Professor	Technopreneurship and Innovation Management
12.	Abayomi, M. A.	B.Sc. (Ibadan), MBA (Ilorin), M.Sc. (Lagos), Ph. D. (Akure)	Reader	Development & Financial Economics
13.	Kolawole, R. J.	B. Tech (Ogbomoso), M.Sc., Ph.D. (Ibadan)	Reader	Agripreneurship and Gender Issues in Entrepreneurship
14.	Adewole, M. A.	B.Sc. M.Sc. (Ibadan) Ph.D. (Ota)	Reader	Human Capital Development
15.	Oloruntuyi, A. O.	B.Sc., M.Sc., Ph. D. (Ado Ekiti)	Reader	Energy Economics
16.	Ayedun, T. A.	B. Agric. (Ago Iwoye), M.Sc. (Portsmouth), MBA (Ado-Ekiti), Ph.D. (Ilishan-Remo)	Senior Lecturer	Entrepreneurial Finance, Entrepreneurial Marketing , Business and Management
17.	Abasilim, A. N.	B.Sc. (Port Harcourt), MBA, M.Phil., Ph.D. (Ife)	Senior Lecturer	Entrepreneurial Marketing
18.	Okhankhuele, O. T.	B.Sc., M.Sc. (Ago-Iwoye), MBA, MPA (Ojo), Ph. D. (Akure)	Senior Lecturer	Enterprise Management
19.	Olayiwola, S. O.	B.Sc., M.Sc., Ph. D. (Ibadan)	Senior Lecturer	Health Entrepreneurship
20.	Ilori, D. B.	B.Sc., M.Sc., Ph. D. (Ado Ekiti)	Senior Lecturer	Entrepreneurial Finance
21.	Anifowose, O. L.	B. Sc. (Iwo), M. Sc. (Cyprus), Ph.D. (KwaZulu-Natal)	Senior Lecturer	Fintech Sustainability and Entrepreneurial Finance
22.	Oke, D. F.	B. Sc. (Ilorin), M. Sc. (Nottingham), Ph. D. (Ile-Ife)	Senior Lecturer /PG Coordinator	Entrepreneurial Finance and Gender Issues in Entrepreneurship
23.	Ogunyemi, F. F.	B. Sc. (Akungba-Akoko), M. Tech., Ph. D. (Akure)	Lecturer I	Marketing and Management
24.	Onafadeji, A. O.	B. Sc. (Ago Iwoye), M. Tech., Ph. D. (Akure)	Lecturer I	General Management, Human Resource Management

9.9.2 DEPARTMENT OF LOGISTICS AND TRANSPORT TECHNOLOGY (LTT)

A. PGD IN LOGISTICS AND TRANSPORT TECHNOLOGY

1. PROGRAMME OFFERED:

PGD in Logistics and Transport Technology

2. PROGRAMME PHILOSOPHY

The Postgraduate Diploma (PGD) programme in Logistics and Transport Technology is designed to meet the manpower requirement in the logistics and transport industry. The programme aims to train graduates from different educational backgrounds to become knowledgeable in Logistics and Transport Technology and to qualify for professional or academic degrees in Logistics and Transport Technology. Therefore, the philosophy of the postgraduate programme in Logistics and Transport Technology is to train graduates to acquire the requisite knowledge for the efficient and effective management of all aspects of logistics and transport and prepare them for a career in the logistics and transport industry.

3. PROGRAMME OBJECTIVES

The objectives of the programme are to:

i. expose postgraduate students to both the theoretical and practical aspects of transport and logistics management;
ii. provide postgraduate students with sufficient knowledge and skill to work competently in management positions in the public and private sectors of the economy;
iii. promote research for the management and improvement of the logistics and transport sector of the Nigerian economy; and
iv. provide a solid intellectual and methodological foundation for Postgraduate Diploma graduates to pursue higher studies.

4. PROGRAMME JUSTIFICATION

The Postgraduate Diploma Programme in Logistics and Transport Technology is a gap-bridging programme to enhance student's knowledge in all areas of logistics and transport for further academic and professional pursuits. It is also meant for sub-professionals and non-professionals currently working in transport establishments and desiring to undergo professional training in Logistics and Transport Management. The programme will boost the manpower requirement in the logistics and transport sector and mitigate the problem of the dearth of professionals in the field. It will also prepare Postgraduate Diploma graduates for professional certification and academic advancement.

5. ADMISSION REQUIREMENTS

The requirements for admission into the Postgraduate Diploma programme in Logistics and Transport Technology are:

i. B. Tech. in Transport Management (third-class degree);
ii. B. Tech/B. Sc. in Agriculture, Engineering, Urban and Regional Planning, Management Sciences, Social Sciences, Sciences or any other discipline from a recognised University, with a minimum of second-class lower degree;
iii. Graduates with a third-class degree in any of the listed courses in (ii);
iv. Higher National Diploma (HND) or its equivalent with a minimum of Lower Credit in any of the fields listed in (ii) above and other fields from a recognised Polytechnics.

6. PROGRAMME DURATION

The Postgraduate Diploma Programme shall be for a maximum of **three (3) semesters full-time within eighteen (18) months.**

7. REQUIREMENTS FOR GRADUATION

i. Candidates must complete a minimum of **41 course units** to qualify for the award of a Postgraduate Diploma in Logistics and Transport Technology.

ii. Pass all the required courses for the programme

iii. Successfully complete and defend a research project

iv. Fulfil all the prescribed conditions by the Board of the School of Postgraduate Studies of the University

Master of Technology (M. Tech) Logistics and Transport Technology

1. Programme Offered:

M.Tech of Technology in Logistics and Transport Technology

2. Available Options:

a. Logistics and Air Transportation;
b. Logistics and Land Transportation;
c. Logistics and Maritime Transportation; and
d. Supply Chain Management

3. PROGRAMME PHILOSOPHY

The M.Tech. Logistics and Transport Technology programme is designed to train high-level manpower and technical managers to allocate and manage resources efficiently within the logistics and transport sector. The people's quality of life and the economy's proper functioning depends on how efficiently the transport facilities and modes are managed. The M.Tech. Programme in Logistics and Transport Technology provides opportunities for students to gain advanced skills and competence to manage Logistics and transport operations in different organizations.

4. PROGRAMME OBJECTIVES

The specific objectives of the programme are to:

a) develop students' ability for research skills in the chosen mode of transport for logistics operations;

b) develop and enhance professional competence in transport infrastructural planning and management across various modes;

c) provide high-level manpower capable of fostering investigation and research in the development, management and improvement of the transport sector;

d) provide an opportunity for in-service postgraduate training for staff of transport institutions, organizations, firms, and agencies within and outside Nigeria;

e) acquaint transport professionals with recent technological advances and management techniques in the transport sector and equip them with the ability to apply the principles and theories to Logistics and transport practices; and

f) expose students to the theoretical and practical aspects of logistics and transport studies for advanced research prospects.

5. PROGRAMME JUSTIFICATION

The pivotal role of logistics and transport in nations' socio-economic and political development cannot be overemphasized. Transport contributes immensely to wealth creation, economic growth and social development. It also promotes commerce, communication, spatial interaction and physical development. However, there is a noticeable dearth of professional Logistics and Transport managers to manage the abundant transport resources in the country efficiently. The Logistics and Innovation Technology programme is designed to address the problem of inadequate transport professionals in Nigeria.

6. ADMISSION REQUIREMENTS

A candidate seeking admission into the programme must possess any of the following from the Federal University of Technology, Akure or any other recognized university in and outside Nigeria;

i. B. Tech. in Transport Management Technology with a minimum of Second-Class Lower Division;

iii. B.Sc. in Transport Management/Urban & Regional Planning, Geography or Economics with a minimum of Second-Class Lower division;

iii. B.Tech. In Logistics Management with a minimum of Second-Class Lower Division;

iv. B.Eng./Tech. Civil/Mechanical Engineering/Physics/Remote Sensing & GIS/Computer Science;

v. Postgraduate Diploma (Upper Credit) in Transport Management Technology;

vi. Postgraduate Diploma (Upper Credit) in Logistics and Transport Technology; and

vii. a convincing proposal/statement of purpose.

7. PROGRAMME DURATION: M. Tech. (Logistics and Transport Technology)

The duration of the M. Tech. programme shall be as follows:

a. Full-time – Minimum of 18 months and a maximum of 24 months.

b. Part-time - Minimum of 24 months and maximum of 30 months.

8. GRADUATION REQUIREMENTS

To be eligible for the award of the M. Tech. degree in Logistics and Transport Technology, a candidate must have the following:

i. passed all courses recommended by the Department;
ii. successfully presented at least two seminars: proposal and progress seminars;

iii. fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University; successfully completed and defended a research thesis in an oral examination; and
iv. Completed a minimum of 39-course units (thesis inclusive).

Ph.D. Logistics and Transport Technology

1. PROGRAMME OFFERED:

Doctor of Philosophy (Ph. D.) in Logistics and Transport Technology

Available Options:

i. Logistics and Air Transportation;
ii. Logistics and Land Transportation;
iii. Logistics and Maritime Transportation; and
iv. Supply Chain Management

2. PROGRAMME PHILOSOPHY:

The PhD programme in Logistics and Transport Technology is designed to produce competent researchers who can conduct research independently in their area of specialisation with sound knowledge.

3. PROGRAMME OBJECTIVES:

The specific objectives of the programme are to:

i. consolidates on established professional competence in any area of specialisation in logistics and transport technology;
ii. provide avenues for critical problem-solving in the global logistics and transport industry through creative thinking;
iii. promote the ability of students to analyse data and effectively communicate and disseminate the results of their research; and
iv. enhance the ethical standards of conducting research in logistics and transport.

4. **PROGRAMME JUSTIFICATION**

Vast resources are expended in the logistics and transport industry, and quite frankly, there are a lot of problems and challenges facing this sector. This programme is designed to address various problems in the logistics and transport sector through research with profound philosophies.

5. ADMISSION REQUIREMENTS

A candidate seeking admission into the programme must possess any of the following from the Federal University of Technology, Akure or any other recognised university in and outside Nigeria:

i. M. Tech. (Logistics and Transport Technology) degree of The Federal University of Technology, Akure, with at least 3.50 on the five-point CGPA scale or
ii. M. Tech. (Transport Management Technology) degree of The Federal University of Technology, Akure, with at least 3.50 on the five-point CGPA scale or
iii. M. Tech/M.Sc. (Transport Management Technology, Transport Planning and Management) degree of any other recognised institution with a CGPA of at least 3.50 on the five- point CGPA scale; or
iv. M. Phil. (Logistics and Transport Technology) of The Federal University of Technology, Akure and from any recognised university in and outside Nigeria with at least 3.50 on the five-point CGPA scale;
v. a convincing proposal/statement of purpose.

6. PROGRAMME DURATION

The duration of the Ph.D. Programme shall be as follows:
Full-time: a minimum of 36 months and a maximum of 48 months.
Part-time: a minimum of 48 months and a maximum of 60 months

7. GRADUATION REQUIREMENTS

To be eligible for the award of the Doctor of Philosophy degree in Logistics and Transport Technology, a candidate must have:

i. passed all courses recommended (if any) by the Department,
ii. presented at least three seminars (proposal, progress and final);
iii. published at least two papers from the research or presented evidence of acceptance of articles for publication in reputable journals;
iv. fulfilled all other conditions as prescribed by the Academic Board of School of Postgraduate Studies of the University; and
v. successfully completed and defended a research thesis in an oral examination.

COURSE OUTLINES FOR POSTGRADUATE DIPLOMA

FIRST SEMESTER

COURSE CODE	COURSE TITLE	L	T	P	U
LTT 701	Transport Policy and Planning	2	1	0	3
LTT 703	Research and Quantitative Techniques in Transport Studies	3	0	0	3
LTT 705	Traffic Control and Safety education	2	1	0	3
LTT 707	Transport Technology	2	1	0	3
LTT 709	Management of Transport Enterprises	2	0	0	2
LTT 711	Research Methodology	2	1	0	3
TOTAL					**17**

SECOND SEMESTER

COURSE CODE	COURSE TITLE	L	T	P	U
LTT 702	Land Transport Management	2	1	0	3
LTT 704	Maritime Transportation	2	1	0	3
LTT 706	Logistics and Supply Chain Management	2	1	0	3
LTT 708	Intermodal Transportation	2	1	0	3
LTT 710	Air Transport Management	2	1	0	3
LTT 712	Pipeline Operations and Management	2	1	3	3
LTT 799	PGD Research Project	0	0	18	6
TOTAL					**24**
GRAND TOTAL					**41**

COURSE SYNOPSIS FOR POSTGRADUATE DIPLOMA

LTT 701: Transport Policy and Planning (3 Units)

Land use and transportation planning. Historical development of transport planning. Data inputs (from surveys), matrix building, origin-destination matrix. Data analysis, trip generation, trip distribution, modal split, traffic assignment, and traffic forecasting. Roles of Government in transport development. Identification of key issues in transport policy formulation. Strategies for implementation of Transport Policy. Evaluation of Transport Policies in the different transport sectors.

LTT 702: Land Transport Management (3 Units)

Development in roads passenger transport in Nigeria. Road passenger costs, fares and pricing types and policies. Terminal management in road transport operations. Systems of ownership and control in public and private sectors and organisation of road transport firms. Operations: Asset management. Rail transport and national economy. Socio-economic and environmental issues in rail transport. Technology and rail transport. Rail operations and safety. Rail Transport infrastructural system. Lab: Project work.

LTT 703: Research and Quantitative Techniques in Transportation Studies (2 Units)

Application of statistical/mathematical concepts in transport planning. Analysis of point patterns. Univariate, Bivariate and multivariate methods. Mathematical modelling techniques, viz stochastic, optimisation and entropy models. Introduction to multivariate statistical analysis. Factor and Principal Components Analysis. Time series analysis; linear programming; introduction to computer application in transport studies.

LTT 704: Maritime Transport Management (3 Units)

Definition, classification, varieties and alternatives to formal ports and berths. History of navigation, the definition of modern navigation collision avoidance system, collision risk assessment. Maritime security.

Maritime safety. Economics and management of maritime operations. Restrictions on seaport access.

Laboratory: Case Studies. Lab: Project Work.

LTT 705: Introduction to Traffic Control and Safety Education (3 Units)

Air, Maritime, Rail and Road traffic laws and regulatory measures to improve traffic flow. Road signs. Networks and terminals. Vehicles, users, management and services operations. Private versus public service. Transportation engineering, traffic control and enforcement.

LTT 706: Introduction to Logistics and Supply Chain Management (3 Units)

Introduction to logistics and distribution. Integrated logistics and the supply chain. Customer service and logistics. Material handling principles. Dimensions of material handling. Material handling equipment: storage and order picking equipment; transportation and sorting; shipping; powered and non-powered folk-lift trucks; automated and non-automated storage units; gravity flow storage racks; carousels. Unit loads in material handling:

LTT 707: Introduction to Transport Technology (3 Units)

The technological development of transport from the ancient period to the present day. Management technology in transport. Environmental factors in Transport. Vehicle control and operation, crewless vehicles. Effects of energy shortage on transport and possible solutions. Road capacity and design – standard approaches to road design. The geometric design of streets and highways. Introduction to computer–aided design of junctions and highways. Technologies for road lighting, off-street parking and traffic management. Technologies for signal control at intersections.

LTT 708: Intermodal Transportation (3 Units)

Concepts of unit loads; Unit load devices: pallets; LASH; Ro/Ro; pallets, containers etc. Advantages of ULDs and their technological advances. Development of container services. Air transport compatibility in intermodal transport. Management of thorough transport operations. Operations Research in Transport. Containers. Documentation and application of information systems; International conventions; Marketing and pricing. Inland Container Depots. Accompanied and unaccompanied transportation. Lab: project

LTT 709: Management of Transport Enterprises (3 Units)

Introduction of management principles enterprises. Techniques of measuring social costs and benefits and shadow pricing. Introduction to national income accounting and public sector economics in relation to the transport sector. Illustrative examples from all transport modes. Techniques of organisation and management as applicable to transport. Management of human resources and labour relations. Marketing techniques. Transport Investment decision. Project cost control and cost audit. Cost-profit analysis and decision making.

LTT 710: Air Transport Management (3 Units)

Economic and commercial aspects of Air Transport; Airline operations and their economic regulation. Air freight operations. and management. Air Transport infrastructural requirement. Environment issues in Air transport operation. Role of Air transport in the developed and developing countries. Development of Air Transport in the world and Nigeria. High-speed passenger Air Transport and freight services. Role of Air Transportation in the development of both the developed and developing countries.

LTT 711: Research Methodology (3 Units)

The nature of transport surveys for transport management, with some examples. Sampling and design of samples; estimation and hypothesis testing; accuracy, bias and precision; sampling distributions and standard errors. Panel and longitudinal studies. Scaling methods, motivation studies. Market segmentation. Methods of collecting data, the designing of questionnaires, survey planning and execution. Data processing, coding tabulation and computations. Computers as data capture devices, analysis, interpretation and presentation of transport survey results. Case Studies

LTT 712: Pipeline Operations and Management (3 Units)

Evolution of pipeline transport in Nigeria. Relevance of pipeline transport. Issues in pipeline transport. Pipeline vandalisation and the national economy. Characteristics and organisation of pipeline and petroleum transport.

Terminal and handling equipment in petroleum marketing; interface with other modes and terminals. Route determination and selection. Development and closure of lines. Methods of optimising pipeline capacity in distribution system Land-use pattern in relation to pipeline and petroleum development. Marketing and distribution of Petroleum products.

LTT 799: Research Project (6 Units)

Students are expected to submit independent projects in a chosen area of transport under the guidance of an appointed supervisor.

COURSE OUTLINE FOR M Tech. IN LOGISTICS TRANSPORT TECHNOLOGY

FIRST YEAR, FIRST SEMESTER (COMPULSORY COURSES FOR ALL PROGRAMME OPTIONS)

COURSE CODE	COURSE TITLE	L	T	P	U
LTT 801	Advanced Transport Economics	2	1	0	3
LTT 803	Transport Policy and Law of Carriage	2	1	0	3
LTT 805	Transport Education and Safety	2	1	0	3
LTT 807	Operations Research in Logistics and Transport Technology	2	1	0	3
LTT 809	Research Methodology in Transport Studies	2	1	0	3
LTT 811	Traffic Engineering	2	0	3	3
LTT 813	Intelligent Transport Systems (ITS) I	2	0	3	3
Total					21

FIRST YEAR, SECOND SEMESTER (AIR TRANSPORTATION)

COURSE CODE	COURSE TITLE	L	T	P	U
LTT 802	Airport Management, Safety and Security	3	0	0	3
LTT 804	Air Freight Operations and Technologies	3	0	0	3
LTT 806	Air Transport and Tourism	3	0	0	3
LTT 808	Airlines Economics and Management	3	0	0	3
LTT 810	Logistics and Transport Seminar Series	1	0	3	2
LTT 812	Field Trip (Local/International)	0	0	3	1
Total					15

FIRST YEAR, SECOND SEMESTER (LAND TRANSPORTATION & PLANNING)

COURSE CODE	COURSE TITLE	L	T	P	U
LTT 814	Transportation Planning and ITS II	2	1	0	3
LTT 816	Pipeline Operations	2	1	0	3
LTT 818	Rail Transportations	2	1	0	3
LTT 820	Road Transport Operations	2	1	0	3
LTT 810	Logistics and Transport Seminar Series	1	0	3	2
LTT 812	Field Trip (Local/ International)	0	0	3	1
				Total	15

FIRST YEAR, SECOND SEMESTER (LOGISTICS AND SUPPLY CHAIN MANAGEMENT)

COURSE CODE	COURSE TITLE	L	T	P	U
LTT 822	Supply Chain Management	2	1	0	3
LTT 824	Logistics Operations Management	2	1	0	3
LTT 826	Inventory Management	2	1	0	3
LTT 828	Freight Operations	2	1	0	3
LTT 810	Logistics and Transport Seminar Series	1	0	3	2
LTT 812	Field Trip (Local/ International)	0	0	3	1
Total					1 5

FIRST YEAR, SECOND SEMESTER (WATER TRANSPORTATION)

COURS E CODE	COURSE TITLE	L	T	P	U
LTT 830	Maritime Safety and Security	2	0	3	3
LTT 832	Maritime Economics and Trade	2	1	0	3
LTT 834	Port and Shipping Operations	2	1	0	3
LTT 836	Ship Production Technology and Finance	2	0	3	3
LTT 810	Logistics and Transport Seminar Series	1	0	3	2
LTT 812	Field Trip (Local/ International)	0	0	3	1
Total					1

SECOND YEAR, FIRST SEMESTER

COURSE CODE	COURSE TITLE	L	T	P	U
LTT 899	Master's Thesis Research Project	0	0	36	6
				Total	6
				Grand Total	39

COURSE SYNOPSES

LTT 801: Advance Transport Economics (3 Units)
Transport production and cost structure - Transport production: Transport cost function: the theory: basic definitions and properties; scale and scope in transport production; The role of flow and network. Travel demand and value of time. Extension. Time allocation: a framework for the analysis of time value. Valuation of Users' benefits in transport systems: The Marshallian consumer's surplus. The Neo-classical approach (basics); The compensating and equivalent variations; linking consumer's surplus with equivalent and compensating variations; Social benefits from transport projects; Optimal transport pricing: Applications using the Legit model, the role of individuals' sensitivity to price and quality.

LTT 802: Airport Management, Safety and Security (3 Units)
Physical characteristics of the airport. Capacity, delays and demand management. Level of service. Institutional, organizational and economic characteristics of the airport - airport ownership and management, airport user charges, and Economic regulations. Air traffic control in airports – the generic elements of an ATC system. Airspace and ATC structure, standard procedures, capacity constraints, congestion and air traffic management, and future ATC systems. Security: The early history of aviation security practice. Air transportation evolving supply chain strategies. Air transport security measures. The human elements in aviation security. ICAO established the International Civil Aviation Security Program. Some costs of aviation security. Security procedures. Aviation security and legal environment. Safety: Measuring air safety - some hazards; The Q- statistics.

LTT 803: Transport Policy, Planning and Law of Carriage (3 Units)
Transport Policy formulation process, implementation and stakeholders. Law of contract in transport. Insurance by types and for different transport modes. Law of business and carriage; contracts agency and transport liability. Liability for loss and damages of freight/passenger regarding sea, air and land-based transport. Various Rules and Conventions in Air and sea transport Acts/decrees on the carriage of freight/passenger. Use of containers. Principle of indemnity. Law of carriage in different modes of transport: Maritime, Aviation and Land.

LTT 804: Air Freight Management (3 Units)
Air Cargo Traffic and Capacity. Air Cargo Market Characteristics. Economic and Technical Regulation. Supply: Passenger and Freight Airlines. Supply: Integrated Carriers, Post Offices and Forwarders. Air Cargo Alliances and Mergers. Aircraft and Flight Operations. Airport and Ground Operations. Distribution and Marketing. Pricing and Revenues. Airline Costs. Air Cargo Financial Performance. Air Cargo and the Environment. Air Cargo Forecasting. Air Cargo Issues and Prospects.

LTT 805: Traffic Education & Safety (3 Units)
Safety Issues in Transport. Risk Management. The Risk Management Model. Identifying risks. Assessing risks. Risk Appetite. Addressing risks. Reviewing and reporting risks. Communicating and learning. The extended enterprise. Risk environment and context. Road Safety Indices

LTT 806: Air Transport and Tourism (3 Units) Definition of tourism and common terms in the content (e.g., inclusive tour, package holiday etc.). The main tourist markets and principal areas and destinations cater for them.Historical growth of tourism; recent trends and developments in holiday and leisure travel. Demand and supply factors of tourism. Air Transport for Tourism.

National, regional and local policy on tourism. Financial operation and commercial aspects of tourism. Tourism and the public interest. Transport infrastructure as the basis of land, water and air pollution in relation to air transport development. Transport and global warming. Transport and environmental degradation, vibrations, delays and visual intrusions. Environmental impacts of airport locations.

LTT 807: Operations Research in Transport (3 Units) Linear programming: formulating LP, Solving LP, Sensitivity Analysis, and Duality. Transportation Problems: Formulating transportation problems, Finding BFS for transportation problems, the transportation simplex method, Tran-shipments problems, Assignment problems, Integer programming: Formulating IP Applications: Air transportation: Irregular operations and control. Public transit. Passenger railway optimization. Maritime transportation. Dynamic Models for Freight Transportation. Vehicle routing. Transportation on demand. Inter-modal transportation. Hazardous materials transportation. Traffic Equilibrium. ITS and traffic management.

LTT 808: Airline Economics and Management (3 Units) Airline terminology and definition – basic airline profit equation. Air transportation markets: typical air passenger trip; spatial definitions of airline markets. Origin- Destination Markets Demand: Dichotomy of airlines demand and supply; factors affecting the volume of O-D demand; Quality of Air travel demand Models. The elasticity of air travel demand, air travel demand segments and O-D markets demand functions. Airline competition and market share: Market share/frequency share model; S-curve model formulation. Airline prices and O-D markets. Airline Differential pricing. Airline revenue management. Airline cost categorization. Operating expense comparisons. Measures of airline productivity. Flight planning. Route planning and schedule. Fleet assignment. Aircraft maintenance routing and crew pairing optimization. Airline flight operations: flight crew activities during a typical flight. Labour relationship in the airline industry.

LTT 809: Research Methodology in Transport Studies (3 Units)

The research processes. Research designs: Experimental and quasi-experimental designs; correlational field study (survey) design; Case study research designs; Action research designs; Methods of data collection: asking questions – questionnaires and interviews; documentation and observation. Measurement: Reliability and validity; Scale development. Methods of data analysis: quantitative data: data set-up and initial analysis; quantitative data: multivariate data analysis for answering research questions and hypothesis testing; content analysis. Reporting research findings and ethical considerations: writing up a quantitative or qualitative or qualitative project; ethical issues and conduct in the research practice.

LTT 810: Logistics and Transport Seminar Series (2 Units)

Each student is expected to select a topic that deals with typical air, maritime or overland transportation problems in Nigeria for research. The research must be original, in-depth and neatly packaged for oral presentation at seminars.

LTT 811: Traffic Engineering (3 Units)

Traffic Engineering Studies: Spot speed Studies, Volume Studies, Travel; Time and Delay Studies, and Parking Studies. Fundamental principles of Traffic Flow: Traffic Flow Elements, Flow-Density Relationships, Gap and Gap acceptance, Introduction to Queuing Theory. Intersection Design: Types of At-Grade Intersections, Design Principles for At-Grade Intersection. Capacity and Level of service: Two-lane Highways, Freeways, Multi-lane Highways

LTT 812: Field Work (1 Unit)

Students are expected to visit different transport formations across the various modes of transport. This could be conducted locally or internationally.

LTT 813: Intelligent Transport Systems (3 Units) The Broad Scope of ITS; A Working Definition of ITS; Current Status of ITS; A Critical Review of the State of the

Art in ITS. New Meta-Level Principles for an Untapped ITS Technological Mine: Meta-Level Principles; The ITS Mine and New Mining Implements; Fundamental Issues in Transportation Systems: Principal Characteristics of ITS; Scientific Validation of ITS Designs through Modelling and Simulation. DARYN: A Distributed Decision-Making Algorithm for Railway Networks: The DARYN Approach – Algorithm; Proof of Freedom from Deadlock; Modelling DARYN on a Loosely Coupled Parallel Processor; The nature of GIS; the real world and representations of it. Geographic information and spatial data types: Models and representations of the real world; geographic phenomena; Database management systems.

LTT 814: Urban Transportation Planning (3 Units) Historical development of transportation planning. Data inputs (from Survey), matrix building, origin-destination matrices and data analysis. Trip Analysis. Patterns of travel, frequency, and relationship with socio-economic characteristics. Modelling techniques of travel patterns. Land use and transportation planning. Growth. The historical and emerging context for transportation planning and policy. Contemporary issues in transportation. The governance and equity of transportation. Multi-modal planning concepts and process. Transportation and land use and urban form. Transportation and land use planning best practices. Travel patterns and behaviour. Transit and land use. Freight and goods movement. Transportation demand and systems management. Funding multi-modal transportation systems. Evaluating system performance.

LTT 816: Pipeline Operations and Management (3 Units)
Fluids handling. Types of pipelines. System components: Supervisory Control and Data acquisition systems. Corrosion control systems. Pipeline design: Factors Influencing pipeline design – General pipeline design. Distribution terminals, measurement and flow control, risk of natural hazards and human threats. Co-location issues in corridors. Pipeline construction: Scheduling; reconstruction activities – survey and mapping, staging areas, soil and geology studies; Construction. Pipeline operations: Inspections and markers – inspections during excavation, ROW inspections, pipeline markers and above-ground facilities, change in operating rate, Pipeline repairs. Pipeline security; waste management; cathodic corrosion protection; leak detection; integrity assessments – metal-loss tools, crack-detection tools, geometry tools, mapping tools; Pipeline repairs techniques. Decommission and demotion. Emergencies and off- normal events.

LTT 818: Rail Transport Management (3 Units) Introduction. Evolution of railroad economics. A hedonic cost function approach to estimating railroad costs. Spatially generated transportation demands. Rail passenger demand forecasting: cross-sectional models revisited. Railroad pricing and revenue-to-cost margins in the post-stagger era. Options for restricting the state- owned monopoly railway. Trespassing on the railroad. Energy use and pollutant emissions impacts of short line railroad abandonment. Earnings differentials of railroad managers and labour.

LTT 820: Road Transport Operations (3 Units)
Bus priority: scope for improvement; effective priority; solutions; enforcement; bus priority initiatives; overcoming barriers. The design of-fare systems and fare collection methods. Methods used to control operations. Application of operational research techniques in time-tabling, route planning and roistering of vehicles and crew. Supervision and monitoring of bus operations. Service evaluation methods.

LTT 822: Supply Chain Management (3 Units) Material handling principles. Dimensions of material handling. Material handling equipment: storage and order picking equipment; transportation and sorting; shipping; powered and non-powered folk-lift trucks; automated and non-automated storage units; gravity flow storage racks; carousels. Unit loads in material handling: What is a unit load? Unit loading devices (ULD). Advantages and disadvantages of ULDs. Problems in material handling. Packaging: Product characteristics: physical characteristics; chemical characteristics. Characteristics must be known to the customer; packaging functions - containment, protection, apportionment, unitisation, convenience, and communication. Packaging design: principle. Performance check/testing of packaging. Designing a package.

LTT 824: Logistics Operational Management (3 Units)
Logistics organizational structures; Organizational integration. Manufacturing and materials management:

Introduction; Just-in-time; Manufacturing resource planning; Material requirements planning (MRP); Supply chain planning; Warehousing; Inventory; Transport; Outsourcing: Security and safety in distribution: Logistics and the environment: Alternative fuels. Logistics design strategy; Product characteristics; product life cycle; Packaging; Unit loads. Logistics processes. Logistics network planning Logistics management and organization

LTT 826: Inventory Management (3 Units)
Why do we keep inventory? Typical demand classification and analysis are helpful in inventory management. Why is high-quality forecasting so important for inventory management? Cost aspects of inventory management. Material decoupling point – dependent and independent demands, deterministic and stochastic approaches to inventory management. Calculation of safety and cycle stock. Classical stock replenishment systems (reorder point and cycle review) and their typical combinations. Safety stock in case of dispersed inventories (square-root law). Information decoupling point concepts and their role in the reduction of stock levels. Review of selected logistics concepts and solutions-oriented on stock reduction/rationalization.

LTT 828: Freight Operations (3 Units)
The theory of the first and last miles. Pricing of freight carriage. Nature and types of goods in transit. Containerization and container economics. Packaging and stuffing: the need to save cost and time. Electronic Data Interchange in Logistics and Supply Chain freight operations. Domestics and International Interchanges between land-based modes and other modes of transportation. Planning for freight operations: dispatching and scheduling. Tracking and monitoring of assets and goods in transit. Method of operations: freight only or combined freight and passenger; both advantages and disadvantages.

LTT 830: Maritime Safety and Security (3 Units) Safety and economy; Maritime safety regime; the risk concept; Acceptable risk; Conflict of interest; Expertise and rationality; Maritime Risk Picture: Maritime activity; the concept of accident types; quantitative risk picture; fatality risk; pollution; the risk concept; large-scale accidents; accident phenomenon. Rules and regulation: Scandinavian Star Fire Accident; International Maritime Organization; Flag State Control; Port State Control; Classification Societies. Risk Analysis: Traffic-Based Models. Damage Estimation. Risk Analysis Techniques. Cost-Benefit Analysis. Safety Assessment. Occupational Safety. Accident Analysis. Emergency and Preparedness. Safety management. Corporate Safety Culture.

LTT 832: Maritime Economics and Trade (3 Units) The Economic organization of the shipping market. Merchant shipbuilding and scrapping industry. Cargo and economics of liner shipping. The container ports and terminals. Liner companies, consortia and alliances. Demand for ships; cargo type and ship design; fitting the ship to the shipping operation; Ships for the liner trade. Marine services vessels; Economic criteria for evaluating ship design. The regulatory framework of maritime economics. The law of the sea. Maritime forecasting and market research: the approach to maritime forecasting; preparing for the forecast; forecasting methodology; freight rate forecasting; market research methodology; forecasting problems.

LTT 834: Port and Shipping Operations (3 Units)
The Port users and service providers. Port Operations. Port Production and capacity. Costs – short-run cost, long- run cost, Port output measures. Port prices. Port investment. Ports and macroeconomic effects. Port governance and agglomeration. Port performance and completion. Port competition. Port pollution. Port security and safety. Inland Waterways and Coastal Trade. Inland Ports and Inland Clearance Depots. The Jones Act of 1979 of the USA and the Cabotage Act of 2003 of Nigeria. Inland Waterways and development. Environmental issues in Inland Waterways operations. Case Studies.

LTT 836: Ship Production, Technology and Finance (3 Units)
Production: Ship layout and draughtsmanship. Integration rules and methods. Ship hydrostatics. Principles of sterility and buoyancy. Factors influencing ship size. Ship Building. Vessel replacement from owner's requirement. Dry dock operation. Shipyard bidding/costing. Financing: Ship Finance and Shipping Economics. Financing ships with equity. Financing ships with debt. Finance for new buildings. Leasing ships. Appraising risk on shipping investment. Ship finance and shipping market dynamics

LTT 899: Master's Thesis Research Project (6 Units) Students must carry out independent research works in a chosen transport area under the supervision of a lecturer in the Department. Students must defend their thesis in an oral examination before a panel of examiners.

DOCTORAL THESIS

LTT 999: Doctoral Thesis Research

Students are required to carry out independent research works in a chosen transport area under their research supervisors' guidance. Students must defend their thesis in an oral examination before a panel of examiners.

PhD Programme Timeline			
S/N	**Activity**	**Time**	**Action By**
1.	Registration	As dictated by the SPGS	Student
2.	Proposal Seminar	First year of the programme	Student but with the approval of supervisor(s)
3.	Seminar Series	Holds Weekly	Student presents seminars on the selected topics.
4.	Progress seminar	24th month after the first registration	Student but with the approval of supervisor(s)
5.	Thesis Registration	By the 30th month after the first registration (full-time) and the 42nd month after the first registration (part-time)	Student but with the approval of supervisor(s)
6.	Oral Examination	After registration of the thesis	Student but with the approval of supervisor(s)

LIST OF ACADEMIC STAFF IN DEPARTMENT OF LOGISTICS AND TRANSPORT TECHNOLOGY (LTT)

S/N	Name	Status	Qualifications	Area of Specialization	E-Mail	Phone Number
1	Dr. Kingdom Bello	Senior Lecturer	B.Sc; M.Sc (Ago-iwoye), PhD (Ogbomoso).	Overland Transport	kbello@futa.edu.ng	08033340175
2	Prof. Kolawole Tajudeen Gbadamosi	Professor	B.Sc (Ago Iwoye), M.Sc (Ibadan), Ph.D (Ibadan)	Transport Planning & Safety Management	ktgbadamosi@futa.edu.ng	08055438849
3	Prof. Mobolaji Stephen Stephens	Professor	B.Tech; M.Tech; Ph.D (Owerri)	Air Transport Management	msstephens@futa.edu.ng	08030862846
4	Dr. Ayodele Adekunle Faiyetole	Reader	B.Sc (Ilorin); MSc (ISU, France); Ph.D (Ile-Ife)	Sustainable & Intelligent Transport	aafaiyetole@futa.edu.ng	08032455663
5	Dr. Adedotun Joseph Adenigbo	Reader	B.Sc (Ogbomoso); MSc (NITT); Ph.D (Akure)	Air Transport & Logistics	ajadenibo@futa.edu.ng	08034894900
6	Dr. Ikpechukwu Njoku	Reader	B.Tech; M.Tech; Ph.D (Owerri)	Maritime Transport	injoku@futa.edu.ng	08036645117
7	Dr. Joseph Femi Odesanya	Senior Lecturer	B.Eng. Civil (Minna); M.Eng; Civil Ph.D (Akure)	Planning & Traffic Engineering, Construction Engineering	jfodesanya@futa.edu.ng	08037911642
8	Dr. Chukwuemeka Albert Enyinda	Senior Lecturer	B.Tech; M.Tech (Owerri); PhD (Akure)	Maritime Transport	cuenyinda@futa.edu.ng	09050573298
9	Dr. Samuel Oluwaseyi Olorunfemi	Senior Lecturer	B.Tech; M.Tech; PhD (Akure)	Urban Transport	soolorunfemi@futa.edu.ng	08038572804
10	Dr Olufunto Adedotun Kanyio	Senior Lecturer	B.Sc., MSc (Ago-Iwoye), PhD (Akure)	Transport Economics	fokanyio@futa.edu.ng	07038111125
11	Dr Chijioke Udechukwu Akpudo	Senior Lecturer	B.Tech., M.Tech (Owerri), PhD (Akure)	Maritime Transport	cuakpudo@futa.edu.ng	08035780614
12	Dr Oluwayemi Bosede Aderibigbe	Lecturer I	B.Sc., MSc (Ile-Ife), PhD (Akure)	Urban Transport	oboniya@futa.edu.ng	08038868597
13	Dr Feyisola Olajiire Akinsehinwa	Lecturer I	B.Tech., M.Tech (Ogbomoso), PhD (Akure)	Public Transport	foakinsehinwa@futa.edu.ng	08034659485

9.9.3 DEPARTMENT OF PROJECT Management Technology (PMT)

1. PROGRAMME OFFERED

(a) Postgraduate Diploma in Project Management Technology (PGD. PMT)

(b) Master of Technology in Project Management Technology (M. Tech. PMT).

(c) Ph.D (Project Management Technology)

(d) Master of Technology (M. Tech) in Management Sciences

(e) Doctor of Philosophy (Ph.D) in Management Sciences (Ph.D. MGS)

2. PGD PROGRAMME PHILOSOPHY

The Post-Graduate Diploma (PGD) programme in Project Management Technology is designed to meet the manpower requirements in the infrastructural and productive sectors. The programme aims to train graduates from a variety of background to become knowledgeable in project management and to qualify for professional or academic degree in Project Management Technology. The philosophy of the programme is therefore to train graduates to acquire technical and managerial knowledge for efficient and effective management of all aspects of projects and also to prepare them for a career in Project Management Technology in both public and private sectors.

3. PROGRAMME OBJECTIVES

The post-graduate diploma (PGD) programme in Project Management Technology is primarily designed to provide gap-bridging training in Project Management. The specific objectives of the programme are to:

(a) expose post-graduate diploma students to both the theoretical and practical aspects of project management;

(b) provide post-graduate diploma students with sufficient knowledge and skill to be self-employed and also take up competently management positions in the public and private sectors of the economy;

(c) promote research in the management and improvement of the infrastructural and productive sectors of the Nigerian economy; and

(d) provide a solid intellectual and methodological foundations for post-graduate diploma graduates to proceed to higher post-graduate studies.

PROGRAMME JUSTIFICATION

The Post-graduate Diploma Programme in Project Management Technology is a gap-bridging programme for non-professionals in the infrastructural and productive sectors, who are desirous of obtaining professional qualification in Project Management Technology. This is also meant for sub-professionals and non-professionals who are currently working in various establishments, and are desirous of undergoing a professional training in Project Management Technology. The programme will boost the manpower requirements in the infrastructural and productive sectors and mitigate the problem of scarcity of professionals in the field. In addition it will prepare post-graduate diploma graduates for professional certification and academic advancement. These diplomates can be gainfully employed in road and building industry, communication, oil and gas industry, food processing and manufacturing industry, banking industry as well as international organizations.

5. ADMISSION REQUIREMENTS

Post- graduate Diploma Programme (PGD)

To be eligible for admission, candidates must possess any of the following qualifications:

(a) B. Tech in Project Management Technology, B.Tech/B.Sc in Engineering, B. Tech/B.Sc. in Environmental Sciences or any other related discipline from a recognized University with a minimum of third class degree; or

(b) Higher National Diploma (HND) with a minimum of lower credit or its equivalent in Engineering, Environmental Sciences, Agriculture and other related fields from a recognized polytechnic.

6. PROGRAMME DURATION

The programme shall be for three semesters full-time.

7. GRADUATION REQUIREMENTS

Candidates must complete a minimum of 45 course units to qualify for the award of

Postgraduate Diploma in Project Management Technology.

COURSE OUTLINES

FIRST SEMESTER, FIRST YEAR

Course Code	Course Title	L	T	P	U
PMT 701	Accounting for Managers	3	0	0	3
PMT 703	Quantitative Techniques	1	0	3	2
PMT 705	Principles of Marketing	2	0	0	2
PMT 707	Principles and Practice of Management	2	0	0	2
PMT 709	Financial Management for Managers	3	0	0	3
PMT 711	Principles of Insurance	2	0	0	2
PMT 713	Human Resource Management	2	0	0	2

PMT 715	Engineering Project Planning and Management	3	0	0	3
PMT 717	Applied Research Methods	3	0	0	3
	Total				22

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
PMT 702	Operations Research	3	0	0	3
PMT 704	Construction Technology and Materials	2	0	3	3
PMT 706	Computer Principles and Application	1	0	3	2
PMT 708	Project Performance Management	2	0	0	2
PMT 710	Feasibility Study and Report	2	0	0	2
PMT 712	Business Law	2	0	0	2
PMT 714	Managerial Economics	2	0	0	2
	Total				16

THIRD SEMESTER

Course Code	Course Title	L	T	P	U
PMT 719	Seminar		0	0	6
PMT 799	Research Project		0	0	18
	Total				2 6 8

COURSE SYNOPSES

PMT 701: ACCOUNTING FOR MANAGERS (3 UNITS)

Accounting as a subject and field of study. The role of accounting in an economic unit. Users of accounting information. Elements of accounting – Financial accounting cost accounting. Management accounting. Accounting records and analysis – source document and books of accounts. Methods of accounting record – the double centry system. Accounting records up to the trial balance. Preparation of financial statements from accounting records. Final accounts – the profit and loss account. Balance sheet and sources and application of funds. Accounting principles and conventions.

PMT 702: OPERATIONS RESEARCH (3 UNITS)

History of Operations Research (O.R). Phases of an O. R. Project O.R. and its system orientation. Linear programming model. (Graphical only). Activity analysis applications. Some variants of linear programming, transportation model and the assignment model. Project planning and dulling techniques. Critical Path Method (CPM) and Project Evaluation Review Technique (PERT). Inventory control (DETERMINISTIC CASE). Simplex method of linear programming; Principles of the simplest method; Duality theory and its applications. Non Linear Programming, multiples, equality- constrained, Kuhn-Tucker and condition. Application methods, application to investments planning, work- force plan replacement problems etc. Introduction to waiting line (Queuing Models), arrival time distribution, service time distribution, the basic waiting line models, multiple channel models, applications of Markov Chains, Markov systems, n- step transition probabilities, classification of finite Markov Chains. Some application.

PMT 703: QUANTITATIVE TECHNIQUES (2 UNITS)

The nature and objectives of statistics. Frequency distributions. Measures of location. Measures of dispersion, Essentials of probability distributions. Basic sampling techniques. Decision theory and index numbers. Time series. Correlation and regression analysis. Set theory. Differential and integral calculus. Matrix algebra. Mathematics of investment. Optimization techniques.

PMT 704: CONSTRUCTION TECHNOLOGY AND MATERIALS (3 UNITS)

Civil engineering construction, Road pavement, Bridges, Dams, Habour works, Rail tracks, Airports, Tunneling, Sewage treatment installation etc. Communication system, structural timber, concrete technology, innovation in construction materials and use of local materials.

PMT 705: PRINCIPLES OF MARKETING (2 UNITS)

Marketing concept, Evolution and significance. Marketing functions and institutions. The marketing system, marketing environment, buyers behavior, market segmentation, market measurement and forecasting. Marketing research and demand analysis. Price determination and factors in price setting. The marketing mix: the product concept, product development and life cycle, product classification, marketing strategies, management of the channels of distribution. Promotion: Advertising, personnel selling, public relations and sales promotion marketing and professional services. Appraising the marketing effort.

PMT 706: COMPUTER PRINCIPLES AND APPLICATION (2 UNITS)

Computer history, System theory. System design and analysis. Data network. File structure and file organization. Principles of data design. Data manipulation and administration. Methods of data collection and coding and output. Principles of programme stored instructions and languages. Modes and structured programmes.

PMT 707: PRINCIPLES AND PRACTICE OF MANAGEMENT (2 UNITS)

Meaning and concepts of management. The evaluation of management thought. The planning process. Setting of organizational design. Making organizations more effective. Staffing the organization. Communication and motivation leadership. Organization change and development. Organization structure: Theories and principles. Classical system and contingency theories of organization. Relationship between organizational objectives and structures. Centralization and Decentralization. Line and staff relationship with other departments. Major influences of organizational structure-technology. Organization size, external environment and culture. The dynamics of organization.

PMT 708: PROJECT PERFORMANCE MANAGEMENT (2 UNITS)

Introduction to construction productivity analysis and performance management. Life cycle performance measurement system. Balance Score card. Key performance indicators-Factors affecting construction productivity. On-site factors – job conditions, preplanning management coordination, human factors, equipment utilization, material handling, site organization, work environment (temperature, humidity and wind), Off-site factors – government regulation, financial status organization and contractual constraints, suppliers etc. Direct productivity measurement, production units/inputs. Indirect productivity measurement, work sampling five-minute rating, time-motion study etc. Construction productivity improvement, constructability study, selection of designer contractor and construction measurement firm etc. Benchmarking – history & benchmark.

PMT 709: FINANCIAL MANAGEMENT FOR MANAGERS 3 UNITS

Nature and scope of financial management. The goals of the firm. Sources of finance. Mathematics of finance. Capital investment decisions, including traditional and discounted cash flow appraisal methods. Reasons for and resolution of conflicts in investment ranking, using the NPV and IRR methods. Cost of capital, Theory of capital structure. The concept of leverage. Financial intermediation.

PMT 710: FEASIBILITY STUDY AND REPORT (2 UNITS)

Nature and purpose of feasibility reports. Feasibility study limitations. Steps in feasibility study development. The place of feasibility studies in a project. Components or segments of feasibility studies. Financial analysis in feasibility reports, including cash flow projections, projected income statement and balance sheet. Economic viability appraisal in feasibility reports using accounting rate of return, payback period, internal rate of return and net present value methods. Differences between financial and viability analysis of private sector and public sector projects. Financial and viability appraisal ofpublic sector project.

PMT 711: PRINCIPLES OF INSURANCE (2 UNITS)

Concept of insurance and relationship with Business. Classes of general insurance: insurance of property-fire, social, perils, theft, "ALL RISKS" covers pecuniary loss- business interruption, fidelity guarantee. Insurance of liability-public liability, employers liability. Insurance of transportation-private and commercial vehicles, goods in transit by land. Personal insurance-personal accident and sickness insurance, permanent life assurance –whole, endowment assurance, term assurance. Distinctions between insurable and uninsurable risks. How insurance bundles risk-the insurance pool, reinsurance and co- insurance, risk management identification and analysis of risk, risk reduction, transfer risk. Insurance law: utmost good faith, insurable interest, indemnity, subrogation and contribution. Claims settlement and the application of the indemnity principle, proximate cause. The insurance market: proprietary and mutual companies, reinsurance companies. Insurance brokers and agents, loss adjusters, international insurance and reinsurance markets.

PMT 712: BUSINESS LAW (2 UNITS)

Nature of contract and contractual obligations. Formation of contract-offer and acceptance, consideration, intention to create legal relations. Contents of contract-representations, express terms, implied terms, excluding and limiting terms. Nature and definition of contract of sale of goods, conditions, warranties and representation arising thereof, sellers obligation as to quality and delivery, ownership and risk, problems incidental to documentary transactions and carriage of goods. Definition of agency, relationship between the principal, agent and third parties, types of agents, termination of agency, the rights and liabilities of both the principal and agent towards each other and towards the third party. Legal effects of negotiable instruments, including cheques, promissory notes bills of exchange, negotiability and assignability. Nature of insurance contracts, insurable interest, principles of indemnity, principle of uberrimae fide, express and implied terms of the insurance policy, assignment of insurance policy and reinsurance. Forms of business of organization: sole proprietorship, partnership. Formation of incorporated companies, certificate of incorporation, articles of association; and memorandum.

PMT 713: HUMAN RESOURCE MANAGEMENT (2 UNITS)

The scope, nature, methods and principles of organizational human resources management. Policies and personnel division issues such as manpower planning technique, staffing, human resources training and development, career planning and promotion, deployment, career planning and promotion, deployment, discipline, motivation theory and promotion employee welfare. Principles and techniques of job evaluation. Review of current principles and practices of human resource management in the Nigerian context.

PMT 714: MANAGERIAL ECONOMICS (2 UNITS)

Nature and scope of managerial economics. Business conditions and environment. Forecasting methods and economic analysis of business decisions. Applied macro-economics to business operations. Theory of demand, theory of production, price theory, theory of profit and profit maximization, theory of capital and investment. Macro economics applied to business environment. Factors determining the economic environment of a country. Management theory and accounting. Quantitative elements in managerial economics theory of firms: objectives of business firms, problems in profit management. Depreciation objective: theory versus practice; determination of a reasonable profit target.

PMT 715: ENGINEERING PROJECT PLANNING AND MANAGEMENT (3 UNITS)

Planning, control and evaluation of large scale project. Scheduling, contract system technology, project productivity. Human factors, including technical, political, economic, social and environmental factors. Simulation of the planning, design and construction processes. Network based systems for planning, time and cost of projects. Organization structures for communication and control. Economics of scale in building design, and operations, contrast and documents.

PMT 717: APPLIED RESEARCH METHODS (3 UNITS)

Basic elements of scientific enquiry. The nature and aims of research, types of research, preparation of research proposal. Essential parts of research proposal. Hypothesis and hypothesis testing data collection and analysis, nature and types of questionnaire, sampling and sampling techniques. The significance of theory in research. Presentation of the complete work or organization of thesis. Mechanics and styles of research report. Student will select a researchable topic for seminar presentation at the department for comments and grading.

PMT 799: PGD RESEARCH PROJECT (6 UNITS)

Students will be expected to carry out research in a chosen area of project management under the supervision of an academic staff member. The result of the researchable topic should be creative and should be able to proffer solutions to practical problems in the infrastructural and productive sector. It should be presented and defended successfully before a panel of examiners and be graded.

MASTER OF TECHNOLOGY IN PROJECT MANAGEMENT.

3. PROGRAMME PHILOSOPHY

The Master of Technology (M. Tech) and the Doctor of Philosophy (Ph. D) programmes in Project Management Technology are designed to train high-level manpower to manage the infrastructural and productive sectors of the economy. The adequate functioning of the economy depends on how efficiently the infrastructural and productive sectors are managed. The post-graduate programmes in Project Management Technology aim at creating opportunities for graduates and professionals in the infrastructural and productive sectors to gain advanced technical and managerial knowledge for efficient and effective management of all the aspects of infrastructural and productive sectors. The philosophy of the post-graduate programmes in Project Management Technology is therefore to train high-level technical managers, who will be able to manage resources efficiently within the infrastructural and productive sectors of the national economy.

4. PROGRAMME OBJECTIVES

The specific objectives of the programmes are to:

(a) develop and enhance professional efficiency in infrastructural and productive sectors;

(b) provide high-level manpower capable of carrying out research in the development, management and improvement of the infrastructural and productive sectors;

(c) provide an opportunity for post-graduate training for staff of infrastructural and productive institutions, organizations, firms and agencies within and outside Nigeria;

(d) acquaint Project Management professionals with recent management techniques in the infrastructural and productive sectors and equip them with the ability to apply the principles and theory of management to efficient project execution;

(e) expose post-graduate students to both the theoretical and practical aspects of project management studies for advanced research in the infrastructural and productive sectors.

5. PROGRAMME JUSTIFICATION

The vital role of infrastructural and productive sectors in the socio-economic and political development of nations cannot be quantified. This contributes immensely to wealth creation, economic growth, physical and social development. However, there is a noticeable shortage of professional project managers to manage the abundant infrastructural and productive resources in the country efficiently. The Master of Technology (M.Tech) and the Doctor of Philosophy (Ph.D) degree programmes in Project Management Technology are designed to address the problem of inadequate project management professionals in Nigeria. The postgraduate programmes will produce qualified project management professionals who will occupy management positions and also engage in policy formulation and implementation in the infrastructural and productive sectors.

6. ADMISSION REQUIREMENTS

(a) Master of Technology in Project Management Technology (M. Tech. PMT)

The requirement for admission into M. Tech PMT programme consist of:

(i) B. Tech in Project Management Technology, B. Eng/B. Tech/B. Sc degree in Management, Social Sciences, Engineering, Environmental Sciences, Agriculture and other related disciplines with a minimum of Second Class Lower division;

(ii) B. Eng/B. Tech/B. Sc in Project Management Technology, Management, Social Sciences, Engineering; Environmental Sciences, Agriculture and any other related disciplines with a Third Class degree plus a Postgraduate Diploma (upper credit) in Project Management Technology.

Higher National Diploma (HND) in Project Management Technology, Management, Social Sciences, Engineering, Environmental Sciences, Agriculture and other related disciplines from a recognized Polytechnic with a minimum of Upper Credit plus Postgraduate Diploma (upper credit) in Project Management Technology.

7. PROGRAMME DURATION

Ph.D (Project ManagementTechnology)

The duration of the Ph.D programme shall be as follows: Full Time: A minimum of 36 months and a maximum of 48 months. Part Time: A minimum of 48 months and a maximum of 72 months.

8. GRADUATION REQUIRMENTS

(a). M.Tech (Project Management Technology)

To be eligible for the award of the M. Tech degree in Project Management Technology, a candidate must have:

(i) successfully presented at least two seminars: proposal and final seminars;

(ii) fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University;

(iii) successfully completed and defended a research thesis in an oral examination.

(iv) acquired a minimum of 35 Units

9. COURSE SYNOPSES

M. TECH PROGRAMME IN PROJECT MANAGEMENT TECHNOLOGY

FIRST YEAR FIRST SEMESTER

Course Code	Course Title		L	T	P	U
PMT 801	Applied Quantitative Techniques	2	0	3		3
PMT 803	Fundamentals of System Engineering	2	0	3		3
PMT 805	Resources Management	3	0	0		3
PMT 807	Business Law	2	0	0		2
PMT 809	Managerial Economics	2	0	0		2
PMT 813	Financial Management	2	1	0		3
Electives						3
Total						**19**

ELECTIVES

Course Code	Course Title	L	T	P	U
PMT 815	Project Buildability	3	0	0	3
PMT 817	Design Management	2	1	0	3
PMT 819	Materials Management	2	1	0	3
PMT 821	Projects Procurement	3	0	0	3

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
PMT 802	Advanced Project Management	2	0	3	3
PMT 804	Operations Research	3	0	0	3
PMT 806	Project Planning & Control	2	0	3	3
PMT 808	Human Resources Management	2	0	0	2
PMT 810	Management Information Systems	1	0	3	2
PMT 812	Quality Assurance and Control	2	0	0	2
	Electives				2
	Total				**17**

ELECTIVES

Course Code	Course Title	L	T	P	U
PMT 814	Cost Management	2	0	0	2
PMT 816	Production Management	2	0	0	2
PMT 820	Maintenance	2	0	0	2

THIRD SEMESTER

Course Code	Course Title		L	T	P	U
PMT 897	Seminar		0	0	0	2
PMT 899	Masters Thesis Research Project	0	0	3	12	6
	Total				**14**	

COURSE SYNOPSES

PMT 801 APPLIED QUANTITATIVE TECHNIQUES 3 UNITS

Methods, purpose and tools of social/business investigation, scientific methods, purpose of research, tools of research questionnaires, interviews, observation and secondary sources, nature and objectives of statistics, proxy measures, graphic representation of data frequency distributions, measures of location, measures of dispersion, normal distribution , essential or probability, basic sampling techniques, index numbers, time series, correlation and regression analysis.

PMT 802: ADVANCED PROJECT MANAGEMENT 3 UNITS

Different approaches and strategies of project. Management theory and practice. Project Management techniques in the petrochemical and other industries and their application to construction. Principles of organization of project management, control systems and techniques, project monitoring report systems-use and application of linear programming, PERT-CPM and other scheduling techniques. Concept project management; Project characteristics and types; Attributes of a good project manager; Sizes and needs of projects; Project planning and scheduling; Project analysis and evaluation. Capital rationing among multiple projects, methods of capital rationing and project interdependencies.

PMT 803: FUNDAMENTALOF SYSTEMS ENGINEERING 3 UNITS

Meaning of a system, systems concept, static and dynamic system, feed system behaviour and representation, mathematical description of physical variables, system graphs and diagrams. Formulation of system models, the state space approach, non engineering and engineering system, solution of system models, time domain solution, model solution by transformation, System design, concept control and optimization, computer application in systems design and stimulation.

PMT 804: OPERATIONS RESEARCH 3 UNITS

History of Operations Research (O.R). Phases of an O. R. Project O.R. and its system orientation. Linear programming model. (Graphical only). Activity analysis applications. Some variants of linear programming, transportation model and the assignment model. Project planning and dulling techniques. Critical Path Method (CPM) and Project Evaluation Review Technique (PERT). Inventory control (DETERMINISTIC CASE). Simplex method of linear programming; Principles of the simplest method; Duality theory and its applications. Non Linear Programming, multiples, equality- constrained, Kuhn-Tucker and condition. Application methods, application to investments planning, work- force plan replacement problems etc. Introduction to waiting line (Queuing Models), arrival time distribution, service time distribution, the basic waiting line models, multiple channel models, applications of Markov Chains, Markov systems, n- step transition probabilities, classification of finite Markov Chains. Some application.

PMT 805: RESOURCES MANAGEMENT3 UNITS

Concepts of human, materials, financial, entrepreneurial and intellectual property resources. Resources procurement and determinants of resources availability. Management of each of these resources in the establishment, execution, monitoring and completion of projects. Resource aggregation and leveling, materials management and the specialist needs of trade sub-contractors. Resource management by objective (R.M.O.) Other types of resources. Project planning and resource allocation. Resource management tools. Supply and demand of resources. Management of human resources.

PMT 806: PRODUCTION PLANNING AND CONTROL 3 UNITS

Nature and scope of production planning and control. Planning, execution and control. Organisation of PPC. Central programming planning group methods engineering group. Tool engineering NUP. Material planning group. Scheduling group. Shop progress group. Basic concepts of planning production. Planning breakdown, man hour for manufacture learning curve theory. Improvement in manual skills. Improvement in managerial action.

Work study performance indices and norms. Techniques of work measurement. Layout plan facilities. Product layout, process layout, fixed layout. Aggregate production plan. Scheduling. Shop progress. Shop management. Plant maintenance. Management information system. Input information. Output in terms of booked hours and 5MH. Payment. Performance indices. Incentive schemes. Financial incentives for direct workers. Factors affecting productivities.

PMT 807: BUSINESS LAW 2 UNITS

Elements of the law of Contract. Law of Agency; Nature and creation of principal-agent relationship, rights and units inter-se and vis-a vis third parties, scope of agent's authority, rectification and termination of agency, undisclosed principal, sales of goods and hire purchases and special and special rules relating to such contracts. Bailment's, C.L.F., F.B.O. and ex-shop contracts, Negotiable Instruments: (In outline only) Company Law (In outline only) Insurance Law (In outline only).

PMT 808: HUMAN RESOURCES MANAGEMENT 2 UNITS

The scope, nature, methods and principles of organizational human resource management. Policies and personnel division issues such as manpower planning techniques, staffing, human resources training and development, career planning and promotion, deployment, discipline, motivation theory and promotion employee welfare. Principles and techniques of job evaluation. Review of current principles

and practices of human resource management in the Nigerian context.

PMT 809: MANAGERIAL ECONOMICS 2 UNITS

Scope of managerial economics. Demand decision. Production decision. Introduction to managerial economics. Optimization techniques. Demand theory. Demand analysis. Consumer behaviour and rational choice. Estimating demand function. Business and economic forcasting. Production theory. Technological change and industrial innovation. The analysis of cost. Perfect competition. Sophisticated monopoly pricing. Cane theory. Risk analysis.Auctions. Moral hazard and principal agent problems. Government and business. Wrap up/catch up. Nature and scope of managerial economics. Demand and supply. Consumer demand, demand analysis and demand estimation. Forcasting, production analysis and competitive markets and performance in competitive markets. Monopoly and monopsony. Monopolistic competitive strategy. Pricing practices. Risk analysis, capital budgeting. Government of the marketing economy.

PMT 810: MANAGEMENT INFORMATION SYSTEMS 2 UNITS

Introduction to, and fundamentals of data processing brief history and conventional data, processing methods, manual and mechanized methods. Classification of systems and their relative merits. Closed and open loop systems; effect on time lag; the total system approach and objectives; total systems and sub-systems. Data processing and the Management Information Systems (MIS). The organization of MIS including use of mechanical and electric accounting machines, Flow charting and the principles of systems design and documentation. Managerial uses of the information output as a basis for developing; criteria and systems. Information needs of management and design of MIS, Computer and data processing evolution of the computer and the computer system input, output and control processing unit. Hardware and software introduction to common computer programming languages used in business. (CCBCL FORTRAN, SPSS etc. Electronic Data Processing (EDP) methods; batch processing, real-time processing and the management of EDP. Business system hierarchical structure of organization, the su-optimisation issues.

PMT 812: QUALITY ASSURANCE AND CONTROL 2 UNITS

Introduction: Quality Assurance. Principles and Application of Quality Management. Strategic Planning and risk management (product or service). Leadership in quality and Business Management. Quality Assurance and Production or productivity. Concept/ principles of Total Quality Control. Quality Assurance Tools and System. Quality Measurement. Quality and auditing. Bench marking. Supplier Quality Management. Statistical Process Control.

PMT813: F I N A N C I A L M A N A G E M E N T 3 UNITS

Nature, scope and objectives of business finance, profit maximization versus wealth maximization as objectives of business finance. Acquisition of capital long term, medium term and short term capital .Cost of Capitalization, rate value firm, effects of gearing on capitalization and the value of firm. Dividend policy, Investment policy. Evaluation of capital expenditure criteria used such as pay -back period methods, accounting rate of return discounted cash flow method including the use of NPV and IRR. Profitability index and Evaluation of capital expenditure under ideal and the real word situation.

PMT 814: COST MANAGEMENT 2 UNITS

Introduction: Meaning of cost and different types of costs. Concept of cost management. Capital budgeting: Concept and method. Target costing. Quality cost. Theory of constraints. Activity based costing and management. Performance Measures factories. Activity based costing. Activity analysis, cost behaviour. Cost management system. Customer profitability analysis. Cost behaviour Patterns. Cost estimation methods. Decision making, relevant cost and benefit. Target costing for new product development. Allocation of cost and revenue. Cost volume and profit analysis.

PMT 815: PROJECT BUILDABILITY 3 UNITS

Buildability is the provision of construction details and materials, which is simply the construction process, Integration of design and construction to improve the chances of achieving a better quality project, completed in a safe manner, on schedule and with the least cost. Principles/Concept of buildability. Design management/planning or project planning. Construction safety and legislation. Construction machinery. Construction cost and construction time. Investment/cost management. Risk management. Buildability score and management. Buildability management system.

PMT 816: PRODUCTION MANAGEMENT 2 UNITS

Analysis of production resources; planning scheduling and forecasting, measurement and evaluation of man machine system; quality and quantity controls; production function models; non-production technologies. Manufacturing and operations strategy, product design and development, quality; performance measurement, plant and machinery acquisition and replacement decisions, scheduling, planning and control of production and inventory, logistic modeling; impact of advanced manufacturing technology; the influence of Japanese management such as Just-in-time (JIT) and Total quality Management (TQM).

PMT 817: DESIGN MANAGEMENT 3 UNITS

Extended definition of design management. Definition of design, management and design leadership. Managing

product aesthetics and corporate design (early contributions). Managing design systematically. Managing design as a strategic asset. Managing design for innovation. Notion of the term "design management". Politic. Promotion and conference. Education. Research. Production design management. Brand design management. Service design management. Business design management. Engineering design management. Urban design management. Architectural management. Value for business. Relation to other disciplines and departments. Hierarchy. Role and responsibility. Design policy. Education.

PMT 819: MATERIALS MANAGEMENT 3UNITS

Concepts of material management – principles, philosophy and source implication for organization. Supply and Demand interfaces and contrast conditions; cost implications for materials management; Quality control, static inventory, problems under risk and uncertainty Logistics management – elements of transportations, elements of storage and material handling; Logistics environment and Logistics organization and control.

PMT 820: MAINTENANCE MANAGEMENT AND PLANNING 2 UNITS

Defining the maintenance level - Maintenance by plan vs. maintenance by default. Equipment reliability and availability. Building a maintenance management plan. Setting and achieving goals. Planning and estimating – Construction estimating methods. Methods time measurement. The maintenance planning thought process – A common sense approach to maintenance estimates.Estimates Based on past performance. Improving the accuracy of estimates. Work packages. Building generic plans. Solving material problems.
Preventive and predictive maintenance – Preventive maintenance defined. Mandatory and discretionary preventive maintenance. Prioritizing candidates for preventive maintenance. Building credible preventive maintenance procedures. Sources of generic preventive maintenance procedures. Sources of generic preventive maintenance procedures. Audits for procedures and programs. Converting preventive to predictive maintenance (PDM). The spectrum of predictive maintenance. Establishing engineering limits. The scheduling process – Prioritizing maintenance work. Dealing with emergencies. Plotting the backlog. Allocation scheduling method. Priority numbering systems. Weekly and daily schedules. Critical path methods for maintenance – Definitions
and conventions. Diagramming methods. Identifying the precedent logic. Dealing with of float (slack). Load leveling resources. Turnarounds, shutdowns and outages.

PMT 821: PROJECTS PROCUREMENT 3UNITS

Different methods of building procurement. Traditional, Design and Build. Management contracting. Contracts, BPF system. BOOT partnership etc. Interpretation of the client's requirement. The evolving nature of projects objectives and the need for the continual Management of the clients/project interface. Management structure- Procurement policy. The role of the expert adviser. Engaging an external expert adviser. Other service providers. Selecting service providers. Managing service providers. Procurement advise. Project characteristics and risks – finding, timing,
policy matters, project complexity, agency requirements, brief. Estimating contract time. Risk identification and
allocation – Project risks. Risk allocation through contracts. Contracting options – Developed Design (DD), Design Development and Contract (DD&C), Design, Novate and Contract (DN & C), Design and Contract (D & C) and Guaranteed Maximum Price (GMP), multiple contracts managing contractor, Alliance contract, Privately Financed Project (PFP). Determining an appropriate contracting
option – Source of fund. Complexity and risk profile of the project design brief. Time constraints. Budget limitations cash flow restrictions. Physical constraints pricing of contract risk. Maintenance requirements.

PMT 897: SEMINAR 2 UNITS

This should consist of an independent work with sound theoretical and investigative approach in a chosen area of project management.

PMT 899: MASTER'S THESIS RESEARCH PROJECT 12 UNITS

This should consist of an independent work with sound theoretical and investigative approach in a chosen area of project management leading to an original contribution to knowledge.

DOCTOR OF PHILOSOPHYIN PROJECT MANAGEMENT

1. PROGRAMME PHILOSOPHY

The Master of Technology (M. Tech) and the Doctor of Philosophy (Ph. D) programmes in Project Management Technology are designed to train high-level manpower to manage the infrastructural and productive sectors of the economy. The adequate functioning of the economy depends on how efficiently the infrastructural and productive sectors are managed. The post-graduate programmes in Project Management Technology aim at creating opportunities for graduates and professionals in the infrastructural and productive sectors to gain advanced technical and managerial knowledge for efficient and effective management of all the aspects of infrastructural and productive sectors. The philosophy of the post-graduate programmes in Project Management Technology is therefore to train high-level technical managers, who will be able to manage resources efficiently within the infrastructural and productive sectors of the national economy.

2. PROGRAMME OBJECTIVES

The specific objectives of the programmes are to:

(a) develop and enhance professional efficiency in

infrastructural and productive sectors;

(b) provide high-level manpower capable of carrying out research in the development, management and improvement of the infrastructural and productive sectors;

(c) provide an opportunity for post-graduate training for staff of infrastructural and productive institutions, organizations, firms and agencies within and outside Nigeria;

(d) acquaint Project Management professionals with recent management techniques in the infrastructural and productive sectors and equip them with the ability to apply the principles and theory of management to efficient project execution;

(e) expose post-graduate students to both the theoretical and practical aspects of project management studies for advanced research in the infrastructural and productive sectors.

3. PROGRAMME JUSTIFICATION

The vital role of infrastructural and productive sectors in the socio-economic and political development of nations cannot be quantified. This contributes immensely to wealth creation, economic growth, physical and social development. However, there is a noticeable shortage of professional project managers to manage the abundant infrastructural and productive resources in the country efficiently. The Master of Technology (M.Tech) and the Doctor of Philosophy (Ph.D) degree programmes in Project Management Technology are designed to address the problem of inadequate project management professionals in Nigeria. The postgraduate programmes will produce qualified project management professionals who will occupy management positions and also engage in policy formulation and implementation in the infrastructural and productive sectors.

4. ADMISSION REQUIREMENTS

To be eligible for the admission into the Ph.D programme in PMT, a candidate must have:

(i) M.Tech (Project Management Technology) degree of The Federal University of Technology, Akure or any other recognized institution, with a weighted average of 60% or at least 3.50 on the five point CGPA scale.

(ii) Candidates for admission into the Ph.D programme must also meet the basic University requirements.

5. PROGRAMME DURATION

(a) Ph.D (Project Management Technology)

The duration of the Ph.D programme shall be as follows:

Full TimeA minimum of 36 months and a maximum of 48 months.

Part Time A minimum of 48 months and a maximum of 72 months.

6. GRADUATION REQUIRMENTS

(a). Ph.D (Project Management Technology)

To be eligible for the award of the Doctor of Philosophy in Project Management Technology, a candidate must have:

(i) passed all courses recommended (if any) by the Department;

(ii) successfully presented at least three seminars (proposal, progress and final);

(iii) fulfilled all other conditions as prescribed by the Board of School of Postgraduate Studies of the University; and successfully completed and defended a research thesis in an oral examination.

MASTER OF TECHNOLOGY IN MANAGEMENT SCIENCE

1. PROGRAMME PHILOSOPHY

The Master of Technology (M.Tech) and the Doctor of Philosophy (Ph.D) programmes in Management Sciences are designed to train high-level manpower to manage the productive resources of the nation, particularly in the Infrastructural and productive sector of the economy. The proper functioning of the economy depend on how efficiently the Infrastructural and productive sector are managed. The Post-graduate programmes in Management Sciences aim at providing opportunities to graduates and professionals in the Infrastructural and productive sector to gain advanced technical and managerial knowledge for efficient and effective management of all the aspects of Infrastructural and productive sector The philosophy of the Post-graduate programmes in Management Sciences is therefore to train high-level technical managers, who will be able to allocate and manage resources efficiently within the Infrastructural and productive sector.

3. PROGRAMME OBJECTIVES

The specific objectives of the programmes are to:

(a) Develop and enhance professional competence in Infrastructural and productive sector management.

(b) Provide high-level manpower capable of fostering investigation and research in the development, management and improvement of the Infrastructural and productive sector.

(c) Provide an opportunity for Post-graduate training for staff of Infrastructural and productive Institutions, Organization, Firms and Agencies within and outside Nigeria.

(d) Acquaint Management Sciences professionals with recent technological advances and management techniques in the Infrastructural and productive sector, and equip them with the ability to apply the principles and theory of management in the Infrastructural and productive sector.

(e) Expose Post-graduate students to both the theoretical and practical aspects of management sciences studies and prepare them for advanced

research in the Infrastructural and productive sector.

4. JUSTIFICATION FOR THE PROGRAMME

The vital role of Infrastructural and productive sector in the socio-economic and political development of nations cannot be overemphasized. It contributes immensely to wealth-creation, economic growth and social development. It also promotes commerce, communication, spatial interaction and physical development. However, there is a noticeable shortage of professional managers to manage the abundant Infrastructural and productive resources in the country efficiently. Non- project professionals now occupy management positions in both public and private project establishments in Nigeria. The master of Technology (M.Tech) and the Doctorate (Ph.D) degree programmes in Management Sciences are designed to address the problem of inadequate professionals in Nigeria. The Postgraduate programme will produce qualified management sciences professionals who will occupy management positions, and also engage in policy formulation and implementation in the Infrastructural and productive sector.

5. ADMISSION REQUIREMENTS

(a) Master of Technology (M. Tech) in Management Sciences

(i) Candidates must have at least a Second Class Lower in B.Tech/B.Sc/B.A Degree in Management Sciences, Management, Social Sciences, Engineering; Environmental Sciences, Agriculture and other related disciplines.

(ii) Postgraduate Diploma (upper credit) in Management Sciences, or Management from a recognized University.

6. PROGRAMME DURATION

(a) M.Tech (Management Sciences)

Full Time 18 months.

7. REQUIREMENTS FOR THE AWARD OF DEGREE

Candidate must complete the minimum course units as specified below to qualified for the award of the Degree:

(i) M.Tech (Management Sciences):

Note: The minimum course units must include 6 units of Project Report.

FIRST SEMESTER FIRST YEAR

Course Code	Course Title	L	T	P	U
MGS 641	Management theory and process	2	0	0	2
MGS 643	Managerial Economics	2	0	0	2
MGS 645	Business Statistics & Research Method	2	0	0	2
MGS 647	Accounting and Finance	2	0	0	2
MGS 649	Quantitative Techniques	2	0	0	2
MGS 651	Business Law		2	0	0	2
Total						**12**

FIRST YEAR SECOND SEMESTER

Course Code	Course Title	L	T	P	U
MGS 642	Human Resources Management	2	0	0	2
MGS 641	Production Management	2	0	0	2
MGS 646	Organization theory (Behaviour)	2	0	0	2
MGS 648	Managerial Accounting & Finance	2	0	0	2
MGS 650	Computer Applications in Business	2	0	0	2
MGS 652	Marketing Management	2	0	0	2
	Total				**12**

SECOND YEAR THIRD SEMESTER

Course Code	Course Title	L	T	P	U
MGS 653	Business Policy & Strategic Management				2
MGS 655	Financial Management				2
MGS 657					2
MGS 699	Masters Thesis Project				6
	Total				**12**

Basis of awarding degree – Minimum of 36 Units out of which 30 units must be compulsory courses and 6 units for thesis

COURSE SYNOPSES

MGS 641: Management Theory and Process 2 Units

This course will deal with the evolution of management as both theory and practice; the role and nature of management in different socio-economic system; the functions of management; human factors in management; approaches to the measurement and the control of organizational performance; organizational efficiency and effective handling of delegation and time, in organization and management development; organization design; problems of management in the under-developed as well as developed

countries and emergent perspective and practice.

MGS 642: Human Resources Management 2 Units

The most valuable and most dynamic of all resources is the topic of this course. The students would be required to understand the principles and processes involved in the procurement, utilization, and compensation of human resource. Topics covered included modern organization theories, forecasting and planning of human resources; the relevance of productivity and the concepts of its measurement, recruitment, selection including tests and interviews and evaluation, performance appraisal, leadership and satisfaction theories and practices, wages-theories and administration; trade unionism in Nigeria and in the international context, collective bargaining factory administration, etc.

MGS 643: Managerial Economics 2 Units

Purpose and scope of managerial economics. Environment of the firm. Demand analysis. Demand forecasting. Product policy and product innovation. Cost analysis.Market structure and competition. Pricing. Profit analysis. Marginal analysis. Financial appraisal. Legal and regulatory environment of the
firm. Mergers, integration, diversification, advertisement,
performance analysis, etc.

MGS 644: Production Management 2 Units

The concept of production/operation management. Managing production system. The strategies role of production operation. Optimality and multiple objectives. Sub optimization. Output and revenue. Mathematical treating of breakeven (B.E.P.). Facility layout. Material handling. Organizing and staffing for production operation. The flow shop and job shop. The assignment method. The transportation Algorithm. Inventory management. Capacity planning. Man and Machine.

MGS 645: Business Statistics and Research Method 2 Units

This course includes basic notion of probability, descriptive data analysis, statistical inference and simple regression analysis. The course is designed to improve the ability of students to carry out empirical research and to evaluate published research. Topics covered include the nature of scientific research, theory building and concept definition, formulating hypothesis, validity and reliability, measurement and scaling methods, concepts, and problems in data collection and sampling, criteria for casual inferences, studies and control groups, considerable time will be devoted to report writing including editing, foot noting, etc.

MGS 646: Organization Theory and Behavior 2 Units

A survey of the major theoretical approaches to the study of organization critical review of the contribution of the major organization/administrative theories. An examination of the analysis of organization as systems with emphasis on the assessment of their operational effectiveness and efficiency. A discussion of the relevance of organization/administrative theories to public business administration with special reference to Nigeria andAfrican experience.

MGS 647: Accounting and Finance 2 Units

Accounting as a subject and field of study. The role of accounting in an economic unit. Users of accounting information. Elements of accounting – financial accounting. Cost accounting, management accounting, auditing and tax accounting. Accounting records and analysis. Sources and books of accounts. Method of accounting records – the double entry system. Accounting records up to the trial balance. Preparation of financial statements from accounting records. Final accounts – the profit and loss account, balance sheet and sources and application of funds. Accounting principles and conventions.

MGS 648: Managerial Accounting and Finance 2 Units

Control theory in accounting, feedback open and closed loop system. Types of standard costs; principles of setting performance standards and value standards. The analysis, significance and investigation of variance, Budgeting concept; budgetary control, involvement and motivation, the fixed and flexible budgets centers. The budget period and identification of the principal factor. Variance analysis. Responsibility accounting. Performance evaluation techniques.

MGS 649: Quantitative Techniques 2 Units

Elementary set theory function; inequalities; graphs and elementary matrix operations. The formulation of mathematical models, basic notion of differential and integral calculus with business applications and general treatment of applications of linear programming and similar techniques. Linear programming, simplex algorithm and duality, transportation and assignment algorithm. Game theory, Queuing theory, inventory theory, market chains, mathematical programming and elements of goal programming.

MGS 650: Computer Application in Business 2 Units

Computer history, system theory, system design and analysis, data network, file structure and file organization. Principles of data design. Data manipulation and administration methods of data collection. Computer hardware and software. Memory and backing store, input and output devices, and data communication, Input and Output control.

MGS 651: Business Law 2 Units

Topics covered include: Laws of contract, agency, sale of goods, hire purchase, carriage of goods, negotiable instrument, money lending, suretyship and guarantees basic provisions of law governing, insurance and banking

institutions in Nigeria. An introduction to sources of Nigeria law, administration of justice in Nigeria, civil and criminal liability, real and personal property, partnership law, corporate personality and the doctrine of ultravites. Types of companies, company formation, procedure and documentation issue and transfer of shares and debentures, prospectus and statutory books, meetings and resolutions, duties of officers (directors, secretary, etc.) provision relating to disclosure in corporate accounts reconstructions amalgamation and take-overs. Laws relating to bankruptcy, deeds of arrangement voluntary and compulsory liquidation, disposition of property by wills and letters of administrations, etc.

MGS 652: Marketing Management 2 Units

This course begins with a study of the underlying forces, which shape marketing decisions such as the marketing systems, demand, consumer motivation and behavior, and the economic, legal, political, and socio-cultural contents within which all marketing decisions must be made. Considerable attention is devoted to the analysis of the components of a good marketing strategy (target – market selection, product, price, promotion, and distribution decisions) and the integration of these elements into an internally and externally consistent whole. Other topics covered include marketing intelligence and social and ethical issues in marketing as they relate to marketing plan formulation and implementation.

MGS 653: Business Policy and Strategic Management 2 Units

The course aims at providing the participants an integrated view in the management of organization and exposing them to situation requiring utilization of multidimensional approach. Care would be taken to provide them with necessary skills and attitudes for formulation and implementation of corporate basic policies and strategies in the contexts of organizational goals, opportunities and challenges.

MGS 655: Financial Management 2 Units

The nature and scope of financial management and its relationship of financial, cost and management, internal and external sources of finances, analysis and interpretation of financial statements and other financial information. Evaluation of capital expenditure proposals, control of capital expenditure. Investment policy cost of capital, dividend policy.

MGS 657: Masters Seminar 2 Units

MGS 699: M.Tech Management Sciences Thesis Project 6 Units

1. DOCTOR OF PHILOSOPHY (Ph.D) IN MANAGEMENT SCIENCES

2. PROGRAMME PHILOSOPHY

The Master of Technology (M.Tech) and the Doctor of Philosophy (Ph.D) programmes in Management Sciences are designed to train high-level manpower to manage the productive resources of the nation, particularly in the Infrastructural and productive sector of the economy. The proper functioning of the economy depend on how efficiently the Infrastructural and productive sector are managed. The Postgraduate programmes in Management Sciences aim at providing opportunities to graduates and professionals in the Infrastructural and productive sector to gain advanced technical and managerial knowledge for efficient and effective management of all the aspects of Infrastructural and productive sector The philosophy of the Post-graduate programmes in Management Sciences is therefore to train high-level technical managers, who will be able to allocate and manage resources efficiently within the Infrastructural and productive sector.

3. PROGRAMME OBJECTIVES

The specific objectives of the programmes are to:

(a) Develop and enhance professional competence in Infrastructural and productive sector management.

(b) Provide high-level manpower capable of fostering investigation and research in the development, management and improvement of the Infrastructural and productive sector.

(c) Provide an opportunity for Post-graduate training for staff of Infrastructural and productive Institutions, Organization, Firms and Agencies within and outside Nigeria.

(d) Acquaint Management Sciences professionals with recent technological advances and management techniques in the Infrastructural and productive sector, and equip them with the ability to apply the principles and theory of management in the Infrastructural and productive sector.

(e) Expose Post-graduate students to both the theoretical and practical aspects of management sciences studies and prepare them for advanced research in the Infrastructural and productive sector.

JUSTIFICATION FOR THE PROGRAMME

The vital role of Infrastructural and productive sector in the socio-economic and political development of nations cannot be overemphasized. It contributes immensely to wealth-creation, economic growth and social development. It also promotes commerce, communication, spatial interaction and physical development. However, there is a noticeable shortage of professional managers to manage the abundant Infrastructural and productive resources in the country efficiently. Non- project professionals now occupy management positions in both public and private project establishments in Nigeria. The master of Technology (M.Tech) and the Doctorate (Ph.D) degree programmes in Management Sciences are designed to address the

problem of inadequate professionals in Nigeria. The Postgraduate programme will produce qualified management sciences professionals who will occupy management positions, and also engage in policy formulation and implementation in the Infrastructural and productive sector.

5. **ADMISSION REQUIREMENTS**

(a) Doctor of Philosophy (Ph.D) Programme

(i) M.Tech (Management Sciences) degree of The Federal University of Technology Akure or any other recognized institution, with a weighted average of 60% or at least 3.50 on the 5 point CGPA scale.

(ii) Candidates for admission into the Ph.D programme must also meet the basic University requirements.

6. **PROGRAMME DURATION**

(a) Doctor of Philosophy (Ph.D) programme

Full Time (36 months)

Part Time (48 months)

7. **REQUIREMENTS FOR THE AWARD OF DEGREE**

Candidate must complete the minimum course units as specified below to qualified for the award of the Degree:

(a) **The Doctor of Philosophy (Ph.D) Management Sciences**

The Doctor of Philosophy (Ph.D) degree in Management Sciences is by research. All Ph.D candidates are expected to carry out research projects and must be supervised by approved Postgraduate lecturers. The research project must also be successfully defended by the candidate in a viva voice examination before a panel of examiners constituted by the School of Postgraduate studies. To qualify for the award of the Ph.D, the project must be of high scholarly value, and must also make salient contribution to the existing body of knowledge. In addition, the candidate must satisfy all other existing requirements as stipulated in the regulations of the Postgraduate school.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF PROJECT MANAGEMENT TECHNOLOGY (PMT)

S/N	NAME	STATUS	AREA OF SPECIALISATION
1	PROF O.J OJO	PROF.	Project Management and Construction Project Management
2	PROF. A. F. LAWAL	PROF.	Energy Technology and Construction Project Management
3	PROF. P. S. OLOWOLAJU	PROF.	Accounting and Finance
4	PROF. O. O. SIMON-OKE	PROF.	Industrial Economics
5	PROF. O. A. JESULEYE	PROF.	Energy, Technology and Innovation Management
6	PROF.. (MRS.) M. O. AJAYI	PROF.	Organisational Resources, Industrial and Management
7	DR. T. EGBETUNDE	READER	Monetary and International Economics
8	DR. A. O. ADEPOJU	SENIOR LECTURER	Energy, Operations, Innovation and Strategy Management
9	DR. O. P. OLOGUNWA	SENIOR LECTURER	Industrial and Managerial Economics
10	DR. (MRS.) H. I. BABALOLA	SENIOR LECTURER	Construction Project Management
11	DR. (MRS.) V. O. OGUNJOBI	SENIOR LECTURER	Agricultural and Industrial Project Management
12	DR. A. O. ADIGUN	SENIOR LECTURER	Monetary and Development Economics
13	DR. O. D. ENIOWO	LECTURER I	Engineering Project Management
14	DR. A. A. OMONORI	LECTURER I	Information Communication Technology and Business Information Management
15	DR. O. A. ALADEJEBI	LECTURER I	Agricultural Economics and Industrial Project Management
16	DR. K. T. ALADE	LECTURER II	Construction Project Management

9.10. SCHOOL OF PHYSICAL SCIENCES

9.10.1 DEPARTMENT OF CHEMISTRY (CHE)

PROGRAMMES IN THE DEPARTMENT AND OPTIONS

The department offers the following programmes:

(a) Postgraduate Diploma (PGD) in Industrial Chemistry

(b) Master of Technology (M.Tech.) with specialization in

i. Analytical Chemistry

ii. Industrial Chemistry

iii. Environmental Chemistry

(c) Ph.D with specialization in all areas of chemistry

POST GRADUATE DIPLOMA (PGD) IN INDUSTRIAL CHEMISTRY

The objectives of this programme are:

(i) Enable graduates of pure and applied chemistry and other related courses particularly with weak grades to upgrade their knowledge so as to qualify to pursue higher degree programmes in industrial chemistry

(ii) Bridge the academic gap between holders of HND qualification (and its equivalent) and first degree programme so as to enable such holders of HND pursue higher degrees in industrial chemistry.

(iii) Provide a further training ground for employers of various chemical and allied industries in their respective specialty areas of operations

ADMISSION REQUIREMENTS AND PROGRAMME DURATION

Applicants must fall into the categories stated in the objectives above to apply for this programme. It involves two semesters course work in prescribed courses and a semester of research project.

M.TECH (ANALYTICAL, INDUSTRIAL AND ENVIROMENTAL CHEMISTY)

ADMISSION REQUIREMENTS AND PROGRAMME DURATION

Eligible applicants should have first or second class honours Bachelor degree in chemistry, chemical engineering, metallurgical engineering, biochemistry or any other relevant field in recognized universities.

Graduates of PGD can only be admitted for an M.Tech. programme if they have a CGPA of at **least** 3.50 out of 5.0. Note that an academic transcript will be required to prove this.

COURSE DURATION

The programme involves a two-semester course work in all options and one semesters of research project. It has a duration of 18-24 months full- time.

DOCTOR OF PHILOSOPHY(PHD)

This is a programme designed to train manpower for tertiary insitutions, industries and research institutes. It is exclusively by research duly supervised by qualified academics.

ADMISSION REQUIREMENTS

Eligibility includes Master of Science or M.Tech. in any field of chemistry with a CGPA of 3.50. out of 5.0. Note that an academic transcript will be required to prove this. The university requires that the student must have credit passes in English language, Physics, Chemistry and Biology/Agric Science.

COURSE DURATION

The duration for this programme is usually between 36 and 48 months for full-time and between 48 and 72 months for part-time.

COURSE OUTLINE

PGD First Semester Courses

Course code	Course title	L	T	P	U
CHE 721	Inorganic chemistry	2	0	2	2
CHE 723	Organic chemistry	2	0	2	2
CHE 725	Physical chemistry	2	0	2	2
CHE 727	Spectroscopy: Theory & Applications	2	1	3	3
CHE 729	Chemical technology I	2	0	2	2
CHE 731	Environmental chemistry	2	0	0	2
CHE 733	Analytical chemistry	2	0	3	2
CHE 799	Project	0	0	9	3
	Total				**13**

Second Semester Courses

Course code	Course title	L	T	P	U
CHE 722	Instrumentation	1	0	3	2
CHE 724	Colour chemistry	2	0	3	3
CHE 726	Polymer chemistry	2	0	3	3
CHE 728	Food chemistry and analysis	2	0	3	3
CHE 730	Chemical technology II	2	0	0	2
CHE 732	Seminar	0	0	6	2
CHE 799	Project	0	0	18	6
	Total				**13**

M.TECH. (ANALYTICAL CHEMISTRY)

First Semester Courses

Course code	Course title	L	T	P	U
CHE 801	Classical methods of analysis	1	1	3	2
CHE 803	Separation methods of analysis	1	1	3	3
CHE 805	Electro-analytical methods	1	1	3	2
CHE 807	Quantitative spectroscopic method	1	1	3	2
CHE 809	Instrumentation	1	1	3	2
CHE 821	Environmental chemistry	2	1	6	3
	Total				**14**

Second Semester Courses

Course code	Course title	L	T	P	U
CHE 802	Advanced techniques in analytical chemistry	1	1	3	2
CHE 804	Water analysis	1	1	3	2
CHE 806	Advanced food analysis	2	0	3	3
CHE 808	Analysis of selected raw materials	1	1	3	2
CHE 810	Recent advances in analytical chemistry	2	0	0	2
CHE 822	Laboratory techniques 1	0	0	1	**Total** **12**
CHE 899	Master's thesis research project	0	0	24	12

M.TECH. (INDUSTRIAL CHEMISTRY)

First Semester Courses

Course code	Course title	L	T	P	U
CHE 803	Separation method of analysis	2	0	3	3
CHE 811	Textile technology	2	0	3	3
CHE 813	Petrochemistry	2	0	0	2
CHE 815	Unit operations	2	0	0	2
CHE 817	Physical chemistry of polymers	2	0	0	2
CHE 821	Environmental chemistry	2	0	1	2
	Total				**14**
CHE 899	Master's thesis research project	0	0	24	12

Second Semester Courses

Course code	Course title	L	T	P	U
CHE 806	Advanced food analysis	2	0	3	3
CHE 812	Industrial organic chemistry	2	0	3	3
CHE 814	Heterogeneous catalysis	2	0	3	3
CHE 816	Seminar	2	0	0	2
CHE 818	Advanced solvent extraction technology	2	0	0	2
	Total				**13**

M.TECH. (ENVIRONMENTAL CHEMISTRY)

First Semester Courses

Course code	Course title	L	T	P	U
CHE 831	Analytical technique I	2	0	3	3
CHE 833	Industrial chemical process III	2	1	0	2
CHE 835	Fuel chemistry	2	1	0	2
CHE 837	Water chemistry	2	0	3	3
CHE 839	Industrial waste management	2	1	0	2
CHE 841	Soil pollution	2	0	3	3
	Total				**15**

Second semester courses

Course code	Course title	L	T	P	U
CHE 832	Analytical technique II	2	0	3	3
CHE 834	Physcial chemistry of atmospheric environment	2	1	0	2
CHE 836	Environmental toxicology	2	0	3	3
CHE 838	Environmental legislation & standard	2	1	0	2
CHE 840	Pollution impact of pesticides	2	1	0	2
CHE 842	Selected topics in environmental pollution	2	1	0	2
CHE 844	Environmental biology	2	1	0	2
	Total				**16**

Third Semester Courses

Course code	Course title	L	T	P	U
CHE 843	Seminar	0	0	0	3
CHE 845	Industrial/Field trip	0	0	3	1
CHE 899	Research project	0	0	36	12
	Total				**16**

COURSE SYNOPSES

POST GRADUATE DIPLOMA(PGD) CHE

721 Inorganic Chemistry (2 units)

Chemistry of –s, -p, -d and f-block elements; relation chemistry electronic structure, size and reactions of the elements. Energy considerations as applied to extraction elements and thermal stability of compounds with regards to inorganic reactions in solutions (aqueous and non-aqueous solvents). Type of reactions and effects of solvent. Oxidation-reduction and substitution reactions. Comparative study of the chemistry of transition elements and their compounds; lanthanides and actinides. Radiochemistry; stability and ratio of neutrons and protons; modes of decay, radioactive displacement laws and decay series.

CHE 722 Instrumentation (2 units)

Light sources: Emission from incandescent bodies, Tungsten filament, Nernst glower, Hydrogen Lamp, vapour discharge, high intensity UV sources. Line sources hollow cathode lamps,

EDT, arcs, sparks, flame and lasers. Optical material properties reflecting coatings and reflection losses. Isolation of radiation: filers, monochromators, dispersion, spectral band pass, resolution resolving power, Franhoffer diffraction, Rayleigh criterion, Prisms deviation and dispersion, resolving power, diffraction gratings-grating equation. Practical: Stray light, f-number, light losses Detectors-photon, thermal barrier layer, cell photoemmisive tube, PMT, thermocouple, Golay cell complete instrument designs, colorimeter spectrophotometer, UV/Visible, IR, ADS/AES, Electricity in instruments, signal and signal processing, data landing elements, complete instrument systems

CHE 723 Organic chemistry (2 units)

Aromatic chemistry: Preparation and reactions of arene derivatives; Electrophilic and nucleophilic substitution in benzene ring: carbonyl chemistry and synthetic applications; Stereochemistry: stereochemistry of organic compounds; optical isomers; compounds; mechanistic Organic chemistry of alicyclic SN1 SN2 El E2 selected topics in natural product biosynthesis and structure determination; chemistry of selected heterocyclic compound containing (O.N.D); reactive Intermediates; formation and reaction of arynes, carbones, nitrenes and free radicals.

CHE 724 Color Chemistry (3 units)

Historical development of both natural and sheets, material synthetic colourants: their classification and indexing. Physical basis of colouration, Molecular structure and chemical constitution and how they relate to colour formation. Principal application classes of colorant; acids, Basic, Reactives, Direct, Vat and Disperse. Brief treatment of the preparative steps involved in the synthesis of colourants and the polymers on which they are applied.

CHE 725 Physical Chemistry (2 units)

Chemical equilibria, ideal and non -ideal solutions, properties of electrolytes, Homogenous and heterogeneous catalyses.

CHE 726 Polymer Chemistry (3 units)

Review of basic polymerization processes of addition and condensation and their mechanisms. Examples of large scale industrial polymers obtained from these process, their properties and chemistry of copolymerization, kinetic composition and chemistry of copolymers. Polymerization conditions of heterogeneous and homogenous systems. Physical polymers and chemistry of polymer solutions.

CHE 727 Spectroscopy: Theory and Applications (3 units)

Quantum theory of rotation and vibration; theory of microwave; or, Raman, UV and NMR spectroscopy introduction to ESR and application of UV, IR, NMR and in chemical analysis and structural elucidation. Emphasis will be on NMR, MS, and GC -MS. High resolution NMR, ^{13}C NMR and other nuclei. Nuclear over Hauser effect. Shift reagents and other new experimental methods coupling and decoupling NMR. Positive and negative ion mass fragmentation. Chemical ionization, field -adsorption MS and application of linked -scan MS.

CHE 728 Food chemistry and Analysis (3 units)

Carbohydrates, proteins, fats and oil. Physical and chemical properties. Ripening and maturation of fruits chemical and physical changes involved. Effects of enzymes in foods. Enzymatic and non –enzymatic browning reactions. Chemistry of fermentation process in the food industry. Proximate analysis of foods with specific examples from milk, and dairy products, fruits and fruits products, oil, cereal and fast foods.

CHE 729 Chemical Technology I (2 unit)

Sources of industrial raw materials and energy, flow sheets, material and energy balance, pilot plants and scale -up chemical technology equipment, process optimization. Unit operations. Quality control and industrial safety.

CHE 730 Chemical Tech II (2 units)

The chemistry and technology of organic and inorganic industrial chemical processes. Production of polymers, adhesives, pesticides, cellulose, fibre, plastics, flavours, pharmaceutical etc. manufacture of some important inorganic chemicals such as cement ammonia, nitric acid, sulphuric acid, fertilizer, mineral processing.

CHE 731 Advance Environmental Chemistry (2 units)

Chemistry industry and needs of mankind. Characteristics of the atmosphere: - Concepts of elementary circles, sources and effect of environmental/air pollution, and rain, global warning, ozone layer depletion, photochemical smog and radiation hazards. Water pollution and control, quality parameters and area of water, effects of fertilizer, sewage and industrial effluents. Water recovery desalination and ion exchange, dealkalisation, solid wastes and theirinstrumental analysis of environmental chemistry asapplied in industries.

CHE 732 Seminar (2 units)

Designed for critical review of current topics of chemical interest. Students are required to write a comprehensive treatise on selected studies and to present graded class seminars on them.

CHE 733 Analytical Chemistry (2 units)

Process in Analytical chemistry -sampling, dissolution and separation of samples and removal of interference - Reporting analytical results-statistical data handling and errors, accuracy and precision. Comparative table of methods of analysis -sample presentation, range sensitivity and detection limit, sample versatility, costs. Classical methods of analysis. Fundamentals complex formation techniques-Acid/bases, precipitation, complexometric, reduction/ oxidation, non –aqueous titrations. Instrumental and point detectors-electrochemical, colourimetric photometric use of automatic instrument (auto titration).

CHE 799 Research Project: - 6 units

This is a 6 -unit course carried out in 3 units per each semester. It is designed to expose the students into the technique of designing and executing a research topic of relevance to the current national needs and those of the various industries that utilize the research findings of chemical and allied institutes. The project is carried out under the department who also serve in addition as adviser to the student on all matters of social and general welfare of the student.

M.TECH ANALYTICAL CHEMISTRY

CHE 801 Classical methods of Analysis - 2 units

Reaction chemistry, chemistry of selected elements, analytical data processing, titrimetry and gravimetry. Practical analysis of mineral samples.

CHE 802- Advance Techniques in Analytical chemistry - 2 units

X-ray methods, neutron activation and radiochemical techniques, Enzymatic and kinetic methods, automated and process analyzers. Plasma spectroscopy; inductively coupled plasma (ICP), microwave plasma (MIP) and direct current plasma (DCP) emission spectroscopy.

CHE 803 -Separation methods of Analysis - 3 units

Solvent extraction, thin layer chromatography, paper chromatography, gas chromatography and liquid chromatography, ion exchange, molecular sieve. Electrophoresis.

CHE 804 Water analysis- 2 units

Quality parameters for various (industrial, agricultural and domestic) uses of water. Methods of analysis of water for various quality parameters. Water pollution control and water treatment.

CHE 805- Electro-analytical methods- 2 units

Potentiometry, voltammetry, electrogravimetry, coulometry, amperometry, polarography.

CHE 806- Advanced Food Analysis - 3 units

Food chemistry, methods of analysis of food for proximate composition parameters, vitamins, mineral additives, and food contaminant. Food quality control.

CHE 807 - Quantitative Spectroscopic methods- 2 units

Flame Spectroscopy, application of UV–Visible Spectrometry, turbidimetry, nephelometry, fluorimetry and polarimetry in quantitative analysis.

CHE 808 – Analysis of selected materials - 2 units

Methods of Analysis of different raw materials, analysis for pesticide residue. Heavy metal contaminant. Soil and geochemical analysis, e.g. characterization and analysis of clays. Air analysis.

CHE 809- Instrumentation - 2 units

Manipulations of different equipment used for chemical analysis. Glass blowing. Minor repairs of equipment.

CHE 810- Recent Advances in Analytical Chemistry - 2 units

Special topics derived from recent research works. This is seminar course that focuses on recent development in analytical chemistry.

CHE 821 - Environmental Chemistry 3 units.

Industrial effluents - Analysis of solid, liquid and gaseous materials. Management of wastes: solids, liquids and gases. Phytoremediation. Analysis and disposal of radioactive materials. Environmental impact assessment (EIA).

CHE 899- Project - 12 units

Each student will be given a research title under the supervision of a lecturer. He will be expected to submit a satisfactory thesis.

(II) M. TECH. INDUSTRIAL CHEMISTRY

CHE 803 separation Methods of Analysis 3 units

Solvent extraction, thin layer chromatography, Paper chromatography, Gas chromatography, Liquid chromatography, Ion exchange and Molecular sieve.

CHE 806 Advanced Food Analysis 3 units

Food chemistry. Methods of analysis of food for proximate composition, parameters, vitamins, amino and fatty acid analysis. Analysis for minerals, additives and food contaminants. Food quality control.

CHE 811 Textile Technology 3 units

Textile properties and definitions. Processing of fibres into fabrics. Spinning, weaving and knitting. Mechanical and Chemical finishing of textiles. Tensile properties of textile fibres.

CHE 812 Industrial Organic Chemistry 3 units

Reactors in Industrial organic transformations. The logic of chemical Synthesis. Basis for retrosynthetic analysis. Transferred based topological, Stereo chemical, functional group and other strategies. Industrial fine and intermediate organic chemicals. Chemotherapeutic and agrochemical agents.

CHE 813 Petrochemistry 2 units

Composition of petroleum, natural gases and oil field water including their origin. Separation and characterization of crude oils. Properties of petroleum, phase behaviour, compressibility and shrinkage, flow behaviour interfacial behaviour and oil refining, reaction and engineering problems. Aspects of petrochemicals

CHE 814 Heterogeneous Catalysis 2 units

Introduction and basic concepts of Industrial heterogeneous catalysis. Absorption processes. Rate and kinetic Models of

catalyst preparation and manufacture. Physical characterization and examination of catalysts. Supported Metal catalysis. Some industrial processes and known catalyst. Experimental methods.

CHE 815 Unit operations 2 -units

Fluid mechanisms- Fluid flow phenomena, basic equations of fluid flow, agitation and mixing of liquids. Heat transfer and its application -heat transfer by conduction in Solids. Principles of heat flow in fluids; heat exchange equipment, Evaporation, mass transfer and its application -phase equilibrium, distillation, leaching and extraction, principles of diffusion, gas absorption. Operations involving particulate solids –size and reducing, crystallization, mixing of solid and pastes, mechanical separation.

CHE 821 Environmental Chemistry 3 units.

Industrial effluents - Analysis of solid, liquid and gaseous materials. Management of wastes: solids, liquids and gases. Phytoremediation. Analysis and disposal of radioactive materials. Environmental Impact assessment (EIA).

CHE 816 Seminars 2 units

A 2 -unit course of critical review of current topics of chemical interest.

CHE 817 Physical Chemistry of Polymers 2 units

Structure and properties of commercially available polymers: Plastics and elastomers, carbon chain, hetero-chain and thermosetting polymers, chemical reactions of polymers; degradation and stabilization, cross linkage, inter and intramolecular rearrangements etc. Polymer solution and properties. Some physical aspects of studying polymer structures.

CHE 818 Advanced solvent Extraction Tech. 2 units

Basic principles of solvent extraction, Interpretation and generation of equilibrium data. Flow sheet calculations for immiscible phases and partially miscible phases. Industrial solvent extraction equipment. Dissociation extraction. Reagents for metals. Industrial processes involving metals and non-metals. Economics of solvent extraction processes

CHE 821 - Environmental Chemistry -3 units.

Industrial effluents - Analysis of solid, liquid and gaseous materials. Management of wastes: solids, liquids and gases. Phytoremediation. Analysis and disposal of radioactive materials. Environmental Impact assessment (EIA).

CHE 899 Project 12 units

A 12 -unit project carried out over 2 Semesters. It is aimed at exposing the students into the technique of designing and executing a research topic of relevance to the various industries that utilize the research findings.

M. TECH ENVIROMENTAL CHEMISTRY

CHE 831 Analytical Technique I (3 Units)

Reporting analytical results- statistical data handlings and errors, accuracy and precision. Process in Analytical Chemistry: sampling, dissolution and separation of samples and removal of interferences- Comparative table of methods of analysis -sample presentation, range, sensitivity and detection limit, sample versatility and costs_ Classical methods of analysis: Gravimetry; precipitation method, purity of precipitate, co-precipitation, conditions of precipitation, precipitation from homogeneous solution, simple gravimetric determination; Titrimetry: - Acid -bases, precipitation, complexometric, oxidation/reduction and non –aqueous titrations.

CHE 832 Analytical Technique II (2 units)

The theory, use and application techniques in the following instrumentations: thin -layer, gas and liquid chromatography, nuclear magnetic resonance spectrometry, electron spin spectrometry, mass spectrometry, atomic./absorption/ emission spectrometry, Neutron activation analysis (NAA) polarographic techniques, infra -red and uv/visible spectrometry.

CHE 833 Industrial Chemical Process III (2 units)

Nature of the chemical industry and its role in national economy. Industrial production, uses and eventual fate of industrial products such as chlorinated hydrocarbons and organo-phosphorus insecticides, herbicides, heavy metals, manufacture and uses of fertilizers, papers and textiles. The pollution effects of industrial products. Food processing and food additives, chemical analysis of chemically -treated foods.

CHE 834 Physical Chemistry of the Atmospheric Environment (2 units)

General structure of the earth's atmosphere, the free movement of air masses and atmospheric residues, types of various pollutants. Classification and chemical nature of atmospheric pollutants. Particulate pollutants, size, ma c s and chemical composition of pollutants, kinetics of atmospheric chemical processes with specific emphasis on gaseous reactions and their mechanisms; Photochemical processes and reactions giving relevant examples involving atmospheric pollutants e.g. ozone chemistry, nitrogen circles, halogen and hydroxyl radicals, hydrocarbons and chlorofluoromethane, acid rain etc. Study of fluorescence, phosphorescence and chemiluminiscence and radiation chemistry.

CHE 835 Fuel Chemistry (2 units)

Photosynthesis as a process of conversion and storage of energy from sun into chemical energy. Products of the direct combustion of plant materials, charcoal making, plant decomposition into fossil fuels. Product of the refining and combustion of fossil fuels. Air pollution, automobiles and industrial emissions. The effect of the oxides of carbon, sulphur and nitrogen in the atmosphere. Conversion of plant materials to clean non-polluting fuels by pyrolysis and fermentation processes. Bio-gas production. Nuclear energy and

radioactive pollution. Geothermal, wind, water, solar and hydrothermal energy. The energy need of man.

CHE 836 Environmental Toxicology (3 units)

Investigation of the sources and toxicity of intermediates and toxic wastes. Principles of hazard assessment of chemicals, exposure analysis, distribution and fates of chemicals in the environment. Hazardous chemical managements; Toxicity and hazards of heavy metals, radioactive elements and organic substances. Effect, analysis, ecotoxicological tests for freshwater, marine and terrestrial environments, tests for carcinogens and mutagens; principles of risk assessment. Practicals shall focus on ecotoxicological tests.

CHE 837 Water Chemistry (3 units)

Advanced treatment of structure, properties, sources and uses of water. Water analysis and water purification techniques. The solubilities of nitrogen, phosphorus, sulphur and carbon oxides in water and the behaviour of their water solutions. Water pollution; fertilizers, detergents, heavy metals, hydrocarbon pesticides, human wastes etc. as agents of water pollution. Eutrophication. The process of bioaccumulation and bio-magnification.

CHE 838 Environmental Legislation and Standards (2 units)

Development of International Environmental Legislation. General principles of public international legislation for the protection of the environment. Development of treaties and regulations. National environmental laws and guidelines; Environmental Impact assessment (EIA), Environmental Audit Report (EAR)/ Environmental Evaluation Studies General regulations; regulation for the terrestrial environment, regulations for the marine environment, regulation for the atmospheric environments. Economics of waste management.

CHE 839 Industrial Waste Management (2 units)

Industrial effluents: Analysis of solid, liquid and gaseous materials. Management of wastes; solid, liquid and gases. Analysis and disposal of radioactive materials. Recycling of domestic and industrial waste products.

CHE 840 Pollution Impact of Pesticides (2 units).

Development of pesticides, survey of major insecticides, fungicides, herbicides and rodenticides. Formulation of pesticides, toxicity and residues of pesticides. Side-effects of pesticides; pesticides in the environment; air, water and soil.

CHE 841 Soil Pollution (3 units)

Soil pollution and degradation: causes, effects and control - pollution from mineral, salts, excessive application of fertilizers and organic manure, heavy metals, pesticides etc. Chemical behaviour of pollutants in soils and sediments with special emphasis on heavy metals. Biological effects of heavy pollutants on phyto and zootoxicity, storage capacity of soil for waste products. Influence of soil pH, redox potentials, organic matter and clay content. Analytical methods of determining soil pollutants; soil sampling, preservation and interpretation of soil pollution indices.

CHE 842 Selected Topics in Environmental Pollution (2 units)

Noise as an environmental nuisance; Barrie principles of acoustic wave theory, measurement and evaluation of noise, sources of noise, limiting values of noise, noise reduction; sound absorption and insulation. Environmental and human health: health and diseases; major diseases:- cardiovascular diseases, cancers; diseases of the locomotors systems. Chemical exposure and health.

CHE 843 Seminar (3 units)

Resources in Environmental Chemistry: A guided library work on the retrieval and correlation of information on environmental chemistry from the current primary and reviewed literature. Discussion to cover current research activities on energy resources, waste disposal, sewage treatment, air and water pollution and any other topics of pressing concern.

CHE 844 Environmental Biology (2 units)

Practical methods for the analysis of microbial population and processes in soil, water and wastes. Major topics, indicator organisms, biodegradation, bioremediation and phytoremediation.

CHE 845 Industrial/Field Trips (1 Unit)

Students are required to visit industries with significant negative impacts on the environment, waste disposal sites, landfills and polluted sites and submit a report of their findings.

CHE 899 Research Project (12 Units)

A 12 -unit project carried out in the third semester of the programme is aimed at exposing the students into the technique of designing and executing a research topic of relevance to the manufacturing/process industries, ministry, public and private sector that can utilize such research findings

PHD WITH SPECIALIZATION IN ALL AREARS OF CHEMISTRY

CHE 999 Doctoral Research Project.

A well -designed project in an interesting subject area of any field of Chemistry will be undertaken subject to the approval of the Department and the intended supervisors.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF CHEMISTRY (CHE)

S/N	Name	Status	Area of Specialisation	Email address	Phone number
1	**Adebayo** Albert Ojo	Professor,	Industrial and Analytical Chemistry	aoadebayo@futa.edu.ng	08033728021
2	**Amoo** Isiaka Adekunle	Professor	Food, Analytical and Environmental Chemistry	iaamoo@futa.edu.ng	08034016068
3	**Adetuyi** Abayomi Olagundoye	Professor,	Polymer, Colour and Textile Chemistry	aoadetuyi@futa.edu.ng	08033801359
4	**Aiyesanmi** Ademola Festus	Professor	Analytical/Environmental Chemistry	afaiyesanmi@futa.edu.ng	08033501293
5	**Okoronkwo** Afamefuna Elvis	Professor	Inorganic and Environmental Chemistry	aeokoronkwo@futa.edu.ng	08034047318
6	**Ogunsuyi** Helen Oluyinka	Professor	Industrial, Environmental and Analytical Chemistry, Clean Energy Technology	hoogunsuyi@futa.edu.ng	07031388288
7	**Ojo** James Oluwasanjo	Professor	Inorganic and Analytical Chemistry	joojo@futa.edu.ng	08038111897
8	**Aletor** Oluwatoyin	Professor	Industrial and Food Chemistry	toyinaletor@yahoo.com	08034735289
9	**Akpambang** Victoria Omolara Enobong	Professor	Analytical and Food Chemistry	voeakpambang@futa.edu.ng	08033700035
10	**Olasehinde** Emmanuel Folorunsho	Professor	Physical and Environmental Chemistry	efolasehinde@futa.edu.ng	08071449406
11	**Adebayo** Matthew Ayorinde	Professor	Physical and Environmental Chemistry	adebayoma@futa.edu.ng	08156206640
12	**Tomori** Wasiu Bolaji	Professor	Industrial/Analytical/Environmental Chemistry /Geochemistry	wbtomori@futa.edu.ng	08036710443
13	**Owokotomo** Ignatius Adekunle	Professor	Organic and Medicinal Chemistry	iaowokotomo@futa.edu.ng	08142352610
14	**Oladele** Ebun-Oluwa Peace	Professor	Food and Analytical Chemistry	epoladele@futa.edu.ng	09038478907
15	**Oluwasina** Olugbenga Oludayo	Reader	Industrial Chemistry (Wood and Pulp Chemistry, Biopolymer, Natural Product Chemistry)	oooluwasina@futa.edu.ng	08107246660
16	**Abata** Emmanuel Orimisan	Reader	Industrial/Environmental Chemistry	eoabata@futa.edu.ng	07036555954
17	**Obaseki** Olubunmi Oluyemi	S/Lecturer	Environmental and Food Chemistry	ooobaseki@futa.edu.ng	08164812537
18	**Jabar** Jamiu Mosebolatan	Reader	Industrial/Polymer Chemistry	jmjabar@futa.edu.ng	08058875953
19	**Adelaja** Oluwaseun Adekoya	S/Lecturer	Environmental Chemistry	oaadelaja@futa.edu.ng	07086394285
20	**Alabi** Omotayo Oluwaseun	Lecturer 1	Environmental Chemistry	ooalabi@futa.edu.ng	08062076359

9.10.2 DEPARTMENT OF MATHEMATICAL SCIENCES (MTS)

POSTGRADUATE PROGRAMMES

1. PROGRAMMES OFFERED

a. Master of Technology (M. Tech) in Industrial Mathematics

b. Doctor of Philosophy (Ph. D) in Mathematics

2. AVAILABLE OPTIONS/SPECIALIZATION (DEGREE OPTION)

(i) Numerical Analysis

(ii) Fluid Dynamics

(iii) Analytical Dynamics

(iv) Optimization

3. THE PHILOSOPHY/OBJECTIVES OF THE PROGRAMME FOR

i) Master of Technology (M.Tech) Industrial Mathematics

ii) Doctor of Philosophy (Ph.D) Mathematics

The Philosophy of the Programme

The programme is designed to equip students with adequate knowledge and skills in Mathematics with focus on application to solving real life and industrial problems. Emphasis is placed on the following five areas around which the student would be expected to specialize. The areas are as listed in 2 above.

The objectives of the programme are to:

i. give academic and professional training in all areas of Mathematics for the development of latent power of thinking of individuals.

ii. provide and promote sound practical and theoretical training in Mathematics as foundation for technological development in Nigeria.

iii. identify the basic scientific and technological problems in area of Mathematics and find appropriate solutions to them.

iv. equip students with critical thinking skills that will enable them to solve real-life problems in areas of agriculture, commerce, industry, medicine and other disciplines that requires the knowledge of Mathematics.

v. give training for the purpose of job placement in the industries for self-actualization.

4. ADMISSION REQUIRMENTS

a. M.TECH. (INDUSTRIAL MATHEMATICS) PROGRAMME

A prospective candidate must hold a B.Tech, B.Sc or B.Sc. Ed. degree (not lower than Second Class Lower Division) in Mathematics of any recognized University/College of Education as a requirement for admission into the School of Post-graduate Studies (SPGS) of the Federal University of Technology, Akure, for the M.Tech. Industrial Mathematics Programme in the department.

b. Ph.D (MATHEMATICS) PROGRAMME

The candidate must have a good Masters degree in Mathematics from any recognized University.

5. DURATION OF THE PROGRAMME

a. M.Tech. PROGRAMME

The Masters of Technology (M.Tech) Programme shall normally run for eighteen (18) calendar months for full-time. There is no part-time studentship for the programme. The first two academic semesters of the M.Tech programme will be devoted to course work. The third semester will be devoted mainly to supervised research work in a specialized area of real life problem. There shall be a proposal seminar and at least a progress seminar before the student is presented for the oral examination of his/her research work.

b. Ph.D. PROGRAMME

The Ph.D programme will normally run for at least thirty-six (36) calendar months of intensive research work for full-time and forty-eight (48) calendar months for part-time students. There shall be a proposal seminar and at least two progress seminars before the student is presented for an open oral examination of his/her research thesis.

6. DEGREE REQUIREMENTS

a. M.TECH DEGREE INDUSTRIAL MATHEMATICS

Each student must take at least 18 credit load units of course work spread over at least two of the research options 2(i) - (iv) above in the department, at least nine out of the 18 credits must be chosen from the major area of specialization and at least four from option (i). In addition, two units of seminar must be successfully offered as indicated. Furthermore, the student will complete satisfactorily a supervised project in any area of applied mathematics and present a written thesis and pass an oral examination on the dissertation. A minimum of 42 units of study are required for graduation including the research project.

b. Ph.D. DEGREE MATHEMATICS

Any student wishing to obtain a Ph.D. degree in mathematics must undertake a supervised programme of study in any of the options specified above. The student will be required to:

i. Complete an approved Research program of at least six semesters.

ii. Present at least two seminars on his research topic before an additional one on completion of the research work.

iii. Complete a doctoral thesis and pass an oral examination.

iv. Demonstrate adequate knowledge of the basic concepts and techniques of the option chosen.

v. Show high intellectual achievement in the oral examination.

MASTERS DEGREE PROGRAMME

COURSE CODES: FIRST SEMESTER

Course Code	Course Title	L	T	P	U
MTS 801	Mathematical Methods				4
MTS 803	Numerical Methods and Computing				4
MTS 805	Numerical Analysis I				3
MTS 807	Numerical Techniques in ODE				3
MTS 809	Viscous flow Theory				3
MTS 811	Advanced Analytical Dynamics				4
MTS 813	Dynamics of Distribution-Parameter System				3
MTS 815	Computational Methods in Optimization I				3
MTS 817	Graduate Seminar				2
	Total				29

SECOND SEMESTER

Course Code	Course Title	L	T	P	U
MTS 802	Complementary Variational Principles				4
MTS 804	Modelling and Simulation				3
MTS 806	Numerical Analysis II				4
MTS 808	Incompressible Boundary Layer Theory				4
MTS 810	Large-Scale Atmospheric Flow				3
MTS 812	Methods of Applied Maths in Dynamics				3
MTS 814	Computational Methods in Optimization II				3
MTS 816	Computational Methods in Optimization III				3
	Total				27
THIRD SEMESTER					
MTS 899	Master's Thesis Research Project				12
	Total				**12**

COURSE SYNOPSES

M. TECH INDUSTRIAL MATHEMATICS

MTS 801 Mathematical Methods 4 Units C

Fourier integrals and relation to Fourier series; Properties of the transform; Hypergeometic equation; functions expressible by Hypergeometic series asymptotic series; Euler Transform; Legendre functions; eigenfuntions and their use; perturbation methods, gamma function; Green's function Laplace transform .

MTS 802 Complementary Variational Principles 4 UnitsE

Euler-Lagrange Theory; Canonical Formalism; Convex functions. The inverse problem, A class of linear problems, Variational formulation, complementary principles, The hypercircle, Error estimates for approximate solutions, Alternative complementary principles, estimates for linear functional. Linear boundary value problems. Non-linear Applications.

MTS 803 Numerical Methods and Computing 4 Units C

Introduction to Programming Languages (e.g. Fortran, Matlab and Maple) and their applications in solving following numerical problems:

A. Numerical solution of initial value problems (IVPs) for ordinary differential equations (ODEs)

   (i) Single-step method – Euler's Method; Runge-Kutta (2nd and fourth order)

   (ii) Multistep Methods – Adams-Moulton Method; Milne-Simpson Method; Evaluation of each of the methods in terms of consistency, convergence and stability.

B. Numerical solution of BVP for ODE

   (i) Shooting method
   (ii) Finite difference method
   (iii) Raleigh method.

C. Solving each of classes of ODE's using the finite difference method appropriate system matrix representation (e.g. tridiagonal matrix) and relevant iterative linear systems method (e.g. Gauss-Siedel or Gaussian elimination methods).

D. Graphical presentation of results output using Excel or any other appropriate graphical packages.

MTS 804 Modelling and Simulation 3 Units C

Definition and classification of models; principles of mathematical Modelling; Modelling Environment; Modelling Techniques - Dimensional Analysis, Finite difference, Calculus, Linear Programming methods, finite element method.

MTS 805 Numerical Analysis I 3 Units E

Solution of algebraic equations; direct methods for linear equation, orthogonal factorisation, spare-matrix techniques. Markowitz criterion, applications; Solution of non-linear equation; one point iterative methods, Newton's and Brain Methods, Regular Falsi method, Gram-Schmidt method, convergence and stability of these methods; applications of these methods. Computing in programming languages.

Note: Compulsory for Numerical option

MTS 806 Numerical Analysis II 4 Units E

Partial differential equations – classification into elliptic, parabolic and hyperbolic equations; Parabolic - solution techniques by explicit methods, Fourier stability methods, matrix methods, stability and convergence analysis of these methods; Elliptic equation solution techniques by finite difference methods, interactive methods ADI methods, Block iteration methods; SOR methods; convergence and stability of these methods. Hyperbolic equation - solution techniques by methods of characteristics, explicit methods, hybrid

methods, Hopscotch methods convergence; stability analysis of these methods

Note: Compulsory for Numerical option

MTS 807 Numerical Tech in ODE 3 Units E Initial and Boundary value problem in ODEs; Numerical approximation of solution; higher order one-step methods - Taylor series, R-K methods; convergence and stability of these methods; Multistep methods - Adams-Moulton methods, predictor-corrector methods; consistency, order, convergence and stability of these methods; topics in approximation - Chebyshev polynomial approximation, least-square approximation, approximation by Series and Rational approximation.

Note: Compulsory for Numerical option

MTS 808 Incompressible Boundary Layer Theory 3 Units

Model problems; Derivation of unsteady boundary layer equations; similarity solutions; steady boundary layer equations; Exact solutions; Approximate solutions of boundary layer equations; occurrence of separation.

Note: Compulsory for Fluid Dynamics option

MTS 809 Viscous Flow Theory 4 Units E

Nature of Viscousity, Equation of motion, special viscous flow problems, methods of solution, outlines of solutions, flow through porous medium. Energy equation, physiological flow model of blood, flow in capillaries. Non-reacting flow near a stagnation-print, viscous heating in a circular tube. Boundary layer theory, triple deck theory, reacting viscous flow. Boundary layer of a stagnation-print reacting flow.

Note: Compulsory for Fluid Dynamics option

MTS 810 Large-Scale Atmospheric Flow 3 Units E

Governing Equations. Simple Types of wave motion in the Atmospheric. Scale Analysis Integral Relations Regarding Voricity and Energy Numerical Methods. Barotropic Models. Baroclinic Models. Multi level models.

Note: Compulsory for Fluid Dynamics option MTS 811 Advanced Analytical Dynamics 4 Units E

Principles of dynamics, strain energy, virtual work, variational principle.Language's equation.Discrete systems, eigenvalue, natural mode of vibration.Approximate methods for finding natural modes and frequencies.

Note: Compulsory for Solid Mechanics option

MTS 812 Methods of Applied Mathematics in Dynamics 3 Units E

In context of application in dynamics, regular and singular perturbation theory, method of matched asymptotic expansions, two-timing (methods of multiple scales) WKB approximation.Averaging methods.

Note: Compulsory for Solid Mechanics option

MTS 813 Dynamics of Distribution-Parameter System 3 Units E

Dynamics of continuous elastic systems (strings, rods, beams membranes and plates); formulation and solution of the boundary value problems; Rayleigh's energy methods; Ralyeigh-Ritz methods; Galerkin's method.

Note: Compulsory for Solid Mechanics option

MTS 814 Computational Methods in Optimization II 3 Units E

Optimization problems; Examples of optimization problems; optimization problems in one dimension; Iterative methods of optimization; least squares methods for solving equation; contraction mapping theorem; Newton's methods; Steepest Descent Methods; Conjugate direction Methods in R; Conjugate Gradient Algorithm; Projection Methods.

MTS 815 Computation Methods in Optimization I 3 Units E

Equality and Inequality Constraints; Unconstrained Minimization; pontryain's principles; Hamiltonian Principles; Extremization of Integrals; Sensitivity analysis; Penalty methods; function space Algorithm; Projection Methods and Application to Optimal Problems.

MTS 816 Computation Methods in Optimization III 3 Units E

Rate of convergence, Conjugate Gradient Methods superlinear convergence: quasi-methods. Super-convergence: conjugate Gradient Methods superlinear convergence variable metric algorithm, Projection.

Note: Compulsory for Optimization option

MTS 817 Graduate Seminar 2 Units C

Presentation of at least one seminar before the end of the program

MTS 899 Master's Thesis Research Project 12 Units C

Remarks: C Compulsory for all students; E Elective

Ph.D DEGREE IN MATHEMATICS

MTS 999 Doctoral Research Project 12 Units

Original research project, which must involve independent investigations in any of the listed fields, should make new and significant contributions to the understanding and knowledge of Mathematics. The report should be presented in form of a thesis using approved format. Every candidate must present, at least, two successful seminars before submission of Ph. D thesis report for examination

LIST OF ACADEMIC STAFF IN DEPARTMENT OF MATHEMATICAL SCIENCES

S/N	NAME	STATUS	AREA OF SPECIALIZATION	PHONE NUMBER	E-MAIL ADDRESS
1	Prof. (Mrs.) B.T. Olabode	Professor	Numerical Analysis	08039739771	btolabode@futa.edu.ng
2	Prof. S.T. Oni	Professor	Analytical Dynamics	08033502059	onist@futa.edu.ng
3	Prof. O. K. Koriko	Professor	Fluid Dynamics	08033509019	okkoriko@futa.edu.ng
4	Prof. F. I. Alao	Professor	Fluid Dynamics	08034727707	fialao@futa.edu.ng
5	Prof. S.J. Kayode	Professor	Numerical Analysis	08033974438	sjkayode@futa.edu.ng
6	Prof. K.S. Adegbie	Professor	Fluid Dynamics	08056655749	ksadegbie@futa.edu.ng
7	Prof. B. Omolofe	Professor	Analytical Dynamics	08035643019	bomolofe@futa.edu.ng
8	Prof. T.O. Awodola	Professor	Analytical Dynamics	08030796073	toawadola@futa.edu.ng
9	Prof. E.A. Areo	Professor	Numerical Analysis	08032096585	eaareo@futa.edu.ng
10	Prof. A.J.Omowaye	Professor	Fluid Dynamics	08030641218	ajomowaye@futa.edu.ng
11	Prof. T.T Yusuf	Professor	Mathematical Biology	08153616134	ttyusuf@futa.edu.ng
12	Prof. K. M. Owolabi	Professor	Numerical Analysis	08035366007	kmowolabi@futa.edu.ng
13	Dr. M.K. Duromola	Senior Lecturer	Numerical Analysis	08035699509	mkduromola@futa.edu.ng
14	Dr. S.O Olatunji,	Senior Lecturer	Complex Analysis	08038370446	soolatunji@futa.edu.ng
15	Dr. A.S. Afolabi	Senior Lecturer	Optimization / Mathematical Biology	08034962666	asafolabi@futa.edu.ng
16	Dr. F.O. Obarhua	SeniorLecturer	Numerical Analysis	08062488066	foobarhua@futa.edu.ng
17	Dr. K.A Dawodu	Lecturer I	Optimization	08032541380	kmdawodu@futa.edu.ng
18	Dr. A.Abidemi	Lecturer I	Mathematical Biology	08036412201	aabidemi@futa.edu.ng
19	Dr. I. L. Animasaun	Lecturer II	Fluid Dynamics	08034117546	ilanimasaun@futa.edu.ng
20	Dr. A.L. Momoh	Lecturer I	Numerical Analysis	07034800503	almomoh@futa.edu.ng
20	Dr. I. D. Ogheneruemu	Lecturer II	Algebra	09038789324	idogheneruemu@futa.edu.ng
21	Dr. F. E. Kazeem	Lecturer II	Topology	09032560089	fekazeem@futa.edu.ng
22	Dr. Olumurewa	Lecturer II	Numerical Analysis	08035146744	okolumurewa@futa.edu.ng

9.10.3 DEPARTMENT OF PHYSICS

2. PROGRAMMES OFFERED

(a) Postgraduate Diploma (PGD)
(b) Master of Technology (M.Tech)
(c) Master of Philosophy (M.Phil.)
(d) M.Phil./Ph.D
(e) Doctor of Philosophy (Ph.D)

3. AVAILABLE OPTIONS / SPECIALIZATION

The Department award
(a) PGD in Physics with electronics
(b) M.Tech
(c) M.Phil. degress with specialization in
  (i) M.Phil. (Condensed Matter Physics)
  (ii) M.Phil. (Electonics Measurements and Instrumentation)
  (iii) M.Phil. (Communication Physics)
  (iv) M.Phil. (Space Physics)
  (i) M.Phil. (Atmospheric Physics)
  (ii) M.Phil. (Radiation and Health/Medical Physics)
  (iii)M.Phil. (Energy Physics)
(d) M.Phil/Ph.D
(e) Ph.D. degrees with specialization in
  (i) Condensed Matter Physics
  (ii) Electronic Measurements and Instrumentation
  (iii) Communications Physics
  (iv) Radiation and Health Physics
  (v) Space Physics
  (vi) Atmospheric Physics

4. PHILOSOPHY AND OBJECTIVES

The philosophy of the Federal University of Technology, Akure is to produce practical oriented graduates. In line with this philosophy, the Department offers postgraduate studies with a variety of experience in applied Physics, with particular emphasis on certain field which are relevant to the economic and technological development of the country. The programmes of the Department are therefore designed to give students the required academic and practical background in Condensed Matter Physics, Space Physics, Radiation and Health Physics, Communication Physics and Electronic Instrumentation Physics.

The objectives of the programme are to:

(i) Impact in the students the fundamentals of the main branches of physics.

(ii) Provide students with opportunity for integrating theoretical physics with practical in all branches of physics.

(iii) Expose the students to all aspects of applied physics sine qua non to the development of Condensed Matter, Electronics and Energy.

(iv) Equip the students with capability for research and development in all areas of theoretical and applied physics.

5. ADMISSION REQUIREMENTS:

Candidates must satisfy the general regulations governing postgraduate studies at the Federal University of Technology, Akure. In addition, the following departmental requirements should be met:-

(a) PGD Programme

Applicants shall possess HND or AIST in any area of physical sciences. Candidates with good honours first degree in any area of physics or third class with experience in industry or government establishment shall also be considered for admission.

(b) M.Tech Programme

(i) Candidates with at least a Second Class (Lower Division) B.Tech. Degree in Physics recognized University is eligible for admission.

(ii) Candidates with at least a Second Class (Lower Division) in Mathematics, Geography, Meteorology and Chemistry from the Federal University of Technology, Akure or any other recognized University may be considered for admission on their own merit. Students who have minor deficiencies in undergraduate preparation, particularly on the areas mentioned in (ii) will be given the opportunity, and may be required to make good these deficiencies before proceeding to postgraduate courses.

(c) M.Phil Programme

The requirements for admission into the M.Phil programme consist of:

(i) M. Tech in any field of Physics from The Federal University of Technology, Akure, with a CGPA of not less than 2.5 on a 5-point credit scale or a minimum overall score of 50% in Master's thesis research project. M. Tech in any field of Physics from other recognized institutions with a CGPA of not less than 3.0 on a 5-point credit scale or a minimum overall score of 55% in Master's thesis research project.

(ii) M. Tech in any field of Physics from other recognized institutions with a CGPA of not less than 3.0 on a 5-point credit scale or a minimum overall score of 55% in Master's thesis research project.

(d) M.Phil/Ph.D Programme

The requirements for admission into the M.Phil/Ph.D programme consist of

i. M. Tech in any field of Physics from The Federal University of Technology, Akure, with CGPA from 3.0 to 3.49 on a 5-point credit scale or

a minimum overall score between 55 and 59% in Master's thesis research project.

ii. M. Tech in any field of Physics from other recognized institutions with a CGPA of not less than 3.0 on a 5-point credit scale or a minimum overall score of 55% in Master's thesis research project or as interpreted according to the respective institution(s).

(d) Doctor of Philosophy (Ph.D) Programme

Candidates for the Ph.D. degree should have obtained the M.Tech degree in Physics from the Federal University of Technology, Akure or any other recognized University with any average grade of B. Where applicable the candidates may be required to score at least 60% in the Master's thesis examination.

6. DURATION OF PROGRAMME

(a) PGD Programme

The **PGD** shall be for a period of 12 months. The two semesters shall be by course work and examinations. The candidates shall present a research project submitted and approved at the end of second semester.

(b) M.Tech Programme

The **M.Tech.** programme shall be for a period of 18 months. The first two semesters shall be by course work and examinations. The third semester shall be by thesis based on a research proposal submitted and approved at the end of the second semester.

(e) M.Phil Programme

The duration of the M.Phil programme shall be as follows:

Full Time: a minimum of 12 months and maximum of 18 months

(e) Doctor of Philosophy (Ph.D) Programme

The Ph.D. shall normally be required to spend between 36 and 48 months for full-time candidates and between 48 and 72 months for part-time candidates.

7. REQUIREMENT FOR GRADUATION

(a) PGD

In addition to satisfying other University regulations, the student must have passed all the courses prescribed by the department and must have obtained a satisfactory grade in the PGD Project according to the regulation of School of Postgraduate Studies.

(a) M.Phil

To be eligible for the award of the Master of Philosophy degree in Physics (M.Phil.), candidate must have:

(a) passed all courses recommended by the department and attain at least a pass mark of 50% in the required courses;

(b) successfully present at least two research seminars (proposal and post research seminars);

(c) fulfilled all other conditions as prescribed by the Board of SPGS of the University; and

(d) successfully defended the research thesis whichshall be assessed at an oral examination organized by the School of Postgraduate Studies.

Candidates who obtain less than 60% or CGPA of 3.5 on a 5-point credit scale shall not qualify for admission into the Ph.D programme and shall be awarded a terminal M.Phil degree.

Requirements for Conversion from M. Phil. to Ph.D. Program me

A candidate who enters the M.Phil. degree programme may be allowed to transfer to the Ph.D. programme if he/ she makes a satisfactory progress in his/her study. Such candidate will be expected to fulfill the following requirements:

(a) completes all course work with a CGPA of not less than 3.50 in the progranmme;

(b) prepares and submit to the Postgraduate School through the Department, research plan considered suitable for pursuing a Ph.D. programme;

(c) presents a detailed report of research work done up to the time and submits to the School of Postgraduate Studies any relevant published or unpublished materials (if any) that can be used to assess him by the Department;

(d) passes an oral transfer examination to be conducted by SPGS with the panel of examiners drawn from his/her Department on the subject of the research and related topics to the field of study; and

(e) fulfilled all other conditions as prescribed by the Board.

Requirements for Conversion from M.Phil./Ph.D to Ph.D. Programme

A candidate who enters the M.Phil. degree programme may be allowed to transfer to the Ph.D. programme if he/she makes a satisfactory progress in his/her study. Such candidate will be expected to fulfill the following requirements:

(a) prepare and submit to the Postgraduate School through the Department, research plan considered suitable for pursuing a Ph.D. programme;

(b) presents a detailed report of research work done up to the time and submits to the School of Postgraduate Studies any relevant published or unpublished materials (if any) that can be used to assess him by the Department;

(c) passes an oral transfer examination to be conducted by SPGS with the panel of examiners drawn from his/her Department on the subject of the research and related topics to the field of study; and

(d) fulfilled all other conditions as prescribed by the Board. Candidates who obtain less than 60% in thesis project shall not qualify for admission into the Ph.D programme and shall be awarded a terminal M.Phil degree.

8. COURSE OUTLINE

(a) POSTGRADUATE DIPLOMA (PGD)

FIRST SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 701	Mathematical Methods	2	1	0	3
PHY 703	Analytical Mechanics	2	1	0	3
PHY 705	Introductory Solid State Electronics	2	1	0	3
PHY 707	Digital Electronics	2	1	0	3
PHY 709	Electronics Devices Design & Fabrication	2	0	3	3
	TOTAL				15

SECOND SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 702	Electromagnetism	2	1	0	3
PHY 704	Quantum Physics	2	1	0	3
PHY 706	Electrical Measurement & Instrumentation	2	0	3	3
PHY 708	Nuclear & Particle Physics	2	1	0	3
PHY 710	Vacuum Physics & Thin Film Technology	3	0	0	3
PHY 712	Energy Conversion And Storage	3	0	0	3
	TOTAL				18

THIRD SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 799	PGD Research Project	0	0	18	6
	Total				6

(b) MASTER OF TECHNOLOGY (M.Tech)

(b1) M.Tech in Condensed Matter Physics

FIRST SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 801 C	Methods of Mathematical Physics	2	1	0	3
PHY 821C	Quantum Mechanics	2	1	0	3
PHY 803C	Electrodynamics	2	1	0	3
PHY 823C	Computational Physics	2	0	3	3
PHY 817C	Digital Electronics	2	0	3	3
	TOTAL				15

SECOND SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 804	Advanced Laboratory & Experimental Techniques	0	0	9	3
PHY 808	Solid State Theory	3	0	0	3
PHY 830	Statistical Physics	2	1	0	3
PHY 823	Compulsory Elective	3	0	0	3
PHY 817	Elective	3	0	0	3
	TOTAL				21

THIRD SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 899	Master's Thesis Research Project	0	0	18	12
	TOTAL				12

COMPULSORY ELECTIVES FOR FIRST SEMESTER						
COURSE CODE		COURSE TITLE	L	T	P	U
PHY 805		Properties of Materials	3	0	0	3
PHY 819		Chaotic Dynamics	3	0	0	3

ELECTIVES FOR SECOND SEMESTER						
COURSE CODE		COURSE TITLE	L	T	P	U
PHY 828		Non-Conventional Energy Sources	0	0	9	3
PHY 809		Solid State Devices Theory	3	0	0	3
PHY 810		Technology & Fabrication of Semiconductor Devices	2	1	0	3
PHY 811		Atomic & Molecular Theory		3	0	0
		3 PHY 812 Technology of Semiconductor Materials	3	0	0	3

(b2) M.Tech ir Electronic Measurement and Instrumentation

FIRST SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 801	Methods of Mathematical Physics	2	1	0	3
PHY 821	Quantum Mechanics	2	1	0	3
PHY 803	Electrodynamics	2	1	0	3
PHY 823	Computational Physics	2	0	3	3
PHY 817	Digital Electronics	2	0	3	3
	TOTAL				15

SECOND SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 804	Advanced Laboratory and Experimental Techniques	0	0	9	3
PHY 826	Electronic Measurements and Instrumentation	3	0	0	3
PHY 818	Control System Techniques	3	0	0	3
PHY 807	Advanced Electronics	3	0	0	3
	Elective	3	0	0	3
	TOTAL				15

ELECTIVES					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 810	Technology and fabrication of semiconductor	3	0	0	3
PHY 812	Technology of semiconductor materials	3	0	0	3

THIRD SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 899	Master's Thesis Research Project	0	0	18	12
	TOTAL				12

(b3) M.Tech in Communication Physics

FIRST SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 801	Methods of Mathematical Physics	2	1	0	3
PHY 821	Quantum Mechanics	2	1	0	3
PHY 803	Electrodynamics	2	1	0	3
PHY 823	Computational Physics	2	0	3	3
PHY 817	Digital Electronics	2	0	3	3
	TOTAL				15

SECOND SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 804	Advanced Laboratory and Experimental Tech.	0	0	9	3
PHY 820	Satellite Technology	3	0	0	3
PHY 814	Radio wave Propagation	3	0	0	3
PHY 816	Antenna Theory	3	0	0	3
	Elective	3	0	0	3
	TOTAL				15

ELECTIVES					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 850	Ionospheric Physics	3	0	0	3
PHY 856	Space Weather	3	0	0	3
PHY 858	Satellive Imagery	3	0	0	3

THIRD SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 899	Master's Thesis Research Project	0	0	18	12
	TOTAL				12

(b4) M.Tech in Radiation and Health Physics

FIRST SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 801	Methods of Mathematical Physics	2	1	0	3
PHY 821	Quantum Mechanics	2	1	0	3
PHY 803	Electrodynamics	2	1	0	3
PHY 823	Computational Physics	2	0	3	3
PHY 817	Digital Electronics	2	0	3	3
TOTAL					15

SECOND SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 804	Advanced Laboratory and Experimental Techniques	0	0	9	3
PHY 822	Radiation Detection of Spectroscopy	3	0	0	3
PHY 824	Advanced Nuclear and Energy Physics	3	0	0	3
PHY 826	Radiation Protection and Dosimetry	3	0	0	3
	Elective	3	0	0	3
	TOTAL				**15**

ELECTIVES					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 811	Atomic and Molecular Theory	3	0	0	3
PHY 813	Physics of Diagnostic and Interventional Radiology	2	0	1	3
PHY 815	Non-conventional energy sources	3	0	0	3
PHY 846	Physics of Nuclear Medicine	3	0	0	3
PHY 851	Physics of Medical Imaging	2		1	3

THIRD SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 899	Master's Thesis Research Project	0	0	18	12
	TOTAL				12

(b5) M.Tech in Space Physics

FIRST SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 801	Methods of Mathematical Physics	2	1	0	3
PHY 821	Quantum Mechanics	2	1	0	3
PHY 803	Electrodynamics	2	1	0	3
PHY 823	Computational Physics	2	0	3	3
PHY 817	Digital Electronics	2	0	3	3
	TOTAL				15

SECOND SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 804	Advanced Laboratory and Experimental Techniques	0	0	9	3
PHY 852	Ionospheric Physics	3	0	0	3
PHY 850	Planetary Atomospheres	3	0	0	3
PHY 854	Physics of Geomagnetic Phenomena	3	0	0	3
	Elective	3	0	0	3
	TOTAL				15

ELECTIVES					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 856	Space Weather	3	0	0	3
PHY 858	Satellite Imagery	3	0	0	3
PHY 899	Master's Thesis Research Project	3	0	0	12

THIRD SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 899	Master's Thesis Research Project	0	0	18	12
	TOTAL				12

(b6) M.Tech in Atmospheric Physics

FIRST SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 801	Methods of Mathematical Physics	2	1	0	3
PHY 821	Quantum Mechanics	2	1	0	3
PHY 803	Electrodynamics	2	1	0	3
PHY 823	Computational Physics	2	0	3	3
PHY 817	Digital Electronics	2	0	3	3
	TOTAL				15

SECOND SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 804	Advanced Laboratory and Experimental Techniques	0	0	9	3
PHY 840	Physics of the Lower Atmosphere	3	0	0	3
PHY 842	Fluid Dynamics	3	0	0	3
PHY 844	Atmospheric Radiation	3	0	0	3
	Elective	3	0	0	3
TOTAL					15

ELECTIVES					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 852	Ionospheric Physics	3	0	0	3
PHY 850	Planetary Atmospheres	3	0	0	3
PHY 858	Satellite Imagery	3	0	0	3

THIRD SEMESTER					
COURSE CODE	COURSE TITLE	L	T	P	U
PHY 899	Master's Thesis Research Project	0	0	18	12
	TOTAL				12

(a) M.Phil

(d1) M.Phil. in Condensed Matter

FIRST SEMESTER						
COURSE CODE	**STATUS**	**COURSE TITLE**	**L**	**T**	**P**	**UNITS**
PHY 869	C	Fluid Dynamics	2	1	0	3
PHY 875	C	Properties of Materials	2	1	0	3
PHY 881	C	Statistical Physics	2	1	0	3
Total						**9**

SECOND SEMESTER						
COURSE CODE		**COURSE TITLE**	**L**	**T**	**P**	**UNITS**
PHY 888	C	Solid State Theory	2	1	0	3
PHY 900	C	M. Phil Research Project	**0**	**0**	**18**	6
	E	Elective Course	3	0	0	3
Total						**12**

ELECTIVE COURSES						
COURSE CODE	**STATUS**	**COURSE TITLE**	**L**	**T**	**P**	**UNITS**
PHY 861		Advanced Nuclear and Energy Physics	3	0	0	3
PHY 868	E	Chaotic Dynamics	3	0	0	3
PHY 891	E	Technology and Fabrication of Semiconductor Devices	2	0	3	3
PHY 893	E	Technology of Semiconductor Materials	3	0	0	3
PHY 894	E	Non-Conventional Energy Sources	3	0	0	3
PHY 895	E	Atomic and Molecular Theory	3	0	0	3
PHY 896	E	Nanoscience and Technology	2	0	3	3

(d2) M. Phil. in Electronic Measurement and Instrumentation

FIRST SEMESTER						
COURS E CODE	**STATUS**	**COURSE TITLE**	**L**	**T**	**P**	**UNIT S**
PHY 863	C	Computational Physics	2	1	0	3
PHY 865	C	Digital Electronics	2	1	0	3
PHY 869	C	Fluid Dynamics	2	1	0	3
Total						**9**

SECOND SEMESTER						
COURSE CODE	**STATUS**	**COURSE TITLE**	**L**	**T**	**P**	**UNITS**
PHY 872	C	Electronic Measurements and Instrumentation	3	0	0	3
PHY 900	C	M. Phil. Research Project	0	0	18	6
	E	Elective Course	3	0	0	3
Total						**12**

ELECTIVE COURSES						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 862	E	Advanced Electronics	3	0	0	3
PHY 870	E	Control Systems Techniques	3	0	0	3
PHY 891	E	Technology and Fabrication of Semiconductor Devices	2	0	3	3
PHY 893	E	Technology of Semiconductor Materials	3	0	0	3

M.Phil. in Communication Physics

FIRST SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 867	C	Electrodynamics	2	1	0	3
PHY 869	C	Fluid Dynamics	2	1	0	3
PHY 879	C	Radio wave Propagation	2	1	0	3
Total						**9**

SECOND SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	U
PHY 892	C	Satellite Technology	3	0	0	3
PHY 900	C	M. Phil. Research Project	**0**	**0**	**18**	6
	E	Elective Course	3	0	0	3
Total						**12**

ELECTIVE COURSES						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	U
PHY 864	E	Antenna Theory	3	0	0	3
PHY 874	E	Ionospheric Physics	3	0	0	3
PHY 890	E	Space Weather	3	0	0	3

FIRST SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 867	C	Electrodynamics	3	0	0	3
PHY 869	C	Fluid Dynamics	2	1	0	3
PHY 871	C	Physics of Geomagnetic Phenomenon	3	0	0	3
Total						**9**

SECOND SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 874	C	Ionospheric Physics	3	0	0	3
PHY 900	C	M. Phil. Research Project	**0**	**0**	**18**	6
	E	Elective Course	3	0	0	3
Total						**12**

ELECTIVE COURSES						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 890	E	Space Weather	3	0	0	3
PHY 878	E	Methods of Mathematical Physics	3	0	0	3
PHY 892	E	Satellite Technology	3	0	0	3

(d4) M.Phil. in Atmospheric Physics

FIRST SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 869	C	Fluid Dynamics	2	1	0	3
PHY 873	C	Physics of the Lower Atmosphere	3	0	0	3
PHY 879	C	Radio wave Propagation	3	0	0	3
Total						**9**

SECOND SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 866	C	Atmospheric Radiation	3	0	0	3
PHY 900	C	M. Phil. Research Project	**0**	**0**	**18**	6
	E	Elective Course	3	0	0	3
Total						**12**

ELECTIVE COURSES						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 880	E	Planetary Atmospheres	3	0	0	3
PHY 892	E	Satellite Technology	3	0	0	**3**

(d5) M.Phil. in Radiation and Health/Medical Physics

FIRST SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 861	C	Advanced Nuclear and Energy Physics	3	0	0	3
PHY 869	C	Fluid Dynamics	2	1	0	3
PHY 877	C	Radiation Detection and Spectroscopy	3	0	0	3
Total						**9**

SECOND SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 886	C	Radiation Protection and Dosimetry	3	0	0	3
PHY 900	C	M. Phil. Research Project	**0**	**0**	**18**	6
	E	Elective Course	3	0	0	3
Total						**12**

ELECTIVE COURSES						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY876	E	Physics of Medical Imaging	2	1	0	3
PHY882	E	Physics of Nuclear Medicine	2	1	0	3
PHY883	E	Physics of Diagnostic and Interventional Radiology	3	0	0	3
PHY885	E	Physics of Radiation Oncology	3	0	0	3
PHY887	E	Radiation Physics	2	0	3	3
PHY889	E	Applied Dosimetry	2	0	3	3
PHY894	E	Non-Convertional Energy Sources	2	1	0	3
PHY895	E	Atomic and Molecular Theory	2	1	0	3
PHY897	E	Computers in Medical Imaging	2	1	3	4

(e) M.Phil. in Energy Physics

FIRST SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 861	C	Advanced Nuclear and Energy Physics	3	0	0	3
PHY 869	C	Fluid Dynamics	2	1	0	3
PHY 875	C	Properties of Materials	2	1	0	3
Total						**9**

SECOND SEMESTER						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 894	C	Non-Conventional Energy Sources	3	0	0	3
PHY 900	C	M. Phil. Research Project	**0**	**0**	**18**	6
	E	Elective Course	3	0	0	3
Total						**12**

ELECTIVE COURSES						
COURSE CODE	STATUS	COURSE TITLE	L	T	P	UNITS
PHY 868	E	Chaotic Dynamics	3	0	0	3
PHY 881	E	Statistical Physics	2	1	0	3
PHY 888	E	Solid State Theory	2	1	0	3
PHY 891	E	Technology and Fabrication of Semiconductor Devices	2	0	3	3
PHY 893	E	Technology of Semiconductor Materials	3	0	0	3
PHY 895	E	Atomic and Molecular Theo	3	0	0	3
PHY 896	E	Nanoscience and Technology	2	0	3	3

C COMPUSORY COURSE, E ELECTIVE COURSE

COURSE SYNOPSES

(a) PGD

PHY 701 Mathematical Methods 3 Units Methods of solving first order o.d.e., second order o.d.e. with constant coefficient. General theory of nth order linear equations. Laplace transform and its use to solve initial- value I problems. Simple treatment of partial differential equations independent variables. Application of o.d.e. to physical life. Special functions of mathematical physics e.g. gamma function, hypergeometric function, Legendre functions, Bessel's functions, Hermite and Laguerre functions, Dirac Deltafunction, Fourier series and transforms. Solution of boundary value problems of p.d.e. by methods of separation of variables and integral transforms Calculus of residues and its application to evaluation of integral and summation of series. Applications to various physical situations which include e.m. theory, quantum theory and diffusion phenomena. Techniques for the solution of boundary value problems. Use of Green's functions.

PHY 702 Electromagnetism 3 Units

Electromagnetic: Superposition, Coulomb's Law, electrostatic force etc. Cause Law and applications. Poisson laplace equations. Boundary value problems, Magnetostatics, static field and matter, electric and magnetic energy. Faraday's law. Moving charges in function fields. Maxwell's equations and applications. Introduction to spherical waves.

PHY 703 Analytical Mechanics 3 Units

Conservative forces and potentials, central forces problems. Rigid body dynamics, generalized motion, mechanics of continous media. Degrees of freedom, generalized coordinates. Lagrange's formulation of mechanics applications. The calculus of variation and the action principles. Hamilton's formulation of mechanics and applications. Oscillatory systems, including damped, forced and coupled oscillations: Normal modes.

PHY704 Quantum Physics 3 Units

Formulation of quantum mechanics in terms of state vectors and linear operators. The theory of angular momentum and spin. Time-dependent and Time-independent perturbation theory. Scattering theory, elastic potential scattering. Green's function and partial wave methods. Selected phenomena from each of atomic physics, molecular physics, solid state physics and nuclear physics are described and interpreted using quantum mechanical models. Some aspects of quantum statistical mechanics.

PHY 705 Introductory Solid State Electronics 3 Units

Electrical conduction in metals and semiconductors. Energy barrier. Motion of charge in electric and magnetic fields. Hall effect. Photoelectric, thermionic and secondary electronic emission phenomena, effects and applications. Fabrication of electronic devices diodes, BJT, FET, Solar cells. Introduction to thin films. Application to IC manufacture.

PHY 706 Electrical Measurements and Instrumentation 3 Units

Principles of measurement errors, accuracy, Detailed working electrical/electronic instruments such as Q-meter, Watt-meter, C.R.O., Semiconductor tester, X-Y plotter, Digital and analogue meters, transducers and application, operational amplifiers, Introduction to the design of electronic equipment.

PHY 707 Electronics 3 Units

Logic gates AND, OR, NAND NOR, EX-OR, EX-NOT, flip-flop, Types of gates DTL, TTL, CMOS, NMOS, ECL, Logic outputs: Totem pole open collector, tristate Combination of systems. Boolean algebra. De Morgan's law, Kanaugh maps, Quine-Mc Cluskey method. Minimisation by computer. Digital switches. Multiplexers and De multiplexers. Counters-asynchronous and synchronous. Digital to analogue, analogue to digital converters.

PHY 708 Nuclear and Particle Physics 3 Units

Nuclear structure: Nuclear properties, nuclear size, nuclear masses, nuclear forces, nuclear-nucleon scattering: the deuteron. Nuclear models. Radioactive decay. Radiation and detectors spectroscopy. Neutron physics, fission and fusion. Nuclear reactor and nuclear energy. Elementary particles: Conservation laws, partial classification. Strong electromagnetic and weak interactions

PHY 709 Electronics Devices and Fabrication 3 Units

Fabrication, design and application of micro-circuits, IC technology, doping process, fabrication of simple devices, pn junction, LEDs, transistors etc.

PHY 710 Vacuum Physics and Thin Film 3 Units

Design and characterization of vacuum systems; different types of vacuum pumps and their uses, measurement of low pressure, different types of pressure gauges: use of valves and other vacuum materials. Industrial uses of vacuum systems, vacuum heating, furnances, induction heating, electron bombardment heating. Vacuum evaporation by various means, evaporation sources and techniques substrate and surface preparation for thin film deposition in vacuum. Ephithaxial. Growth processes. Heath treatment of thin film, compatibility of films and subtrates, sputtering techniques, deposition of thin insulating films by rf, sputtering preparation and use of masks for thin film deposition. Characterization and application of tl in films.

PHY 712 Energy Conversion and Storage 3 Units

Theory of modern energy conversion, transmission and storage methods; windmills, heat engines, classical engines, ocean thermal energy converters, thermoelectric thermionic, fuel cells, production of hydrogen, electrolytic, chemical thermolytic, photolytic, hydrogen storage, photoelectron

converters, photo themovoltaic, biomass, photosynthesis production of methanol and ethanol from vegetable matter.

PHY 799 PGD Research Project 6 Units A research project in contemporary physics under the supervision of staff. A detailed report on the research is presented at the completion of the project.

(b) M.Tech.

PHY 801 Methods of Mathematical Physics (3 units) Techniques for the solution of Boundary value problems, use of Green's functions, integral Equations; Vector Spaces; Tensor Transformations; Materials; Complex Variable theory, Group, Representations and symmetry.

PHY 803 Electrodynamics (3 Units)

Concept of potential and its applications; Single and multiple boundary value problems; The electromagnetic fields energy, forces and momentum relations; Maxwell's equations' solutions of the wave equation; Applications to radiating systems, Elements of relativistic electrodynamics, Moving charges, classical electron theory.

PHY 804 Advanced Laboratory and Experimental Techniques (3 Units)

Three projects in electronics and in basic physical techniques, e.g. vacuum techniques, optical instrumentation.

PHY 805 Properties of Materials (3 Units) The structure of atoms; Bohr-Rutherford, Wave-mechanical models; Inter-atomic and molecular forces; X-ray crystallography; Crystal imperfections-point defect, line defects, dislocation mechanism of slip, role of dislocation, planar defects, atomic movements in solids.

PHY 806 Electronic Measurements and Instrumentation (3 Units)

Errors, Standards, accuracy and calibration; Relationship between specification and circuit performance; Analogue and digital measurements, Transducers and sensors; Signal conditioning, amplification, multiplexing sampling, digital to analogue and analogue to digital conversion. Noise in instrumentation systems; Data indication and recording storage, Signal electrical can optical characterization of signal crystals.

PHY 807 Advanced Electronics (3 Units) Semiconductor diodes, transistors, special power semiconductor devices. Transistor circuits and amplifiers, power distortion, multistage amplifier feed-back and bandwidth. I.C devices and circuits, operational amplifiers, phase locked loops, gyrators, turned circuits active filters, detectors, logarithmic generators, variable gain devices; Analysis of circuits for generating, shaping and manipulation waveforms using elements such as line transformers and I.C's

PHY 808 Solid State Theory(3 Units) Symmetry and group theory; Electron States, Self-consistent field approximations methods; the Semi-surface; Semi-conductors and metals, the Kronig-Penny model, Dynamics of electrons and holes in semiconductors, Insulator bands, Impurity states; Scattering by resonance and impurities; Electronic properties; Thermodynamic, transport, semiconductor systems, screening, Dielectric properties; Optical properties; Lattice vibrations; Phonon and the lattice specific heat; Electron-phonon interactions, Superconductivity. Density functional theory and its applications.

PHY 809 Solid State Devices Theory (3 Units) PN junction theory, homo and heterojunctions, metal-semiconductor junction; General characteristics and physical limitations of bipolar transistor; Relation of physical properties to electrical characteristics; Theory of junction-field effect transistor, Theory of insulated gate transistors; properties of the metal-oxide; semiconductor system and its applications in insulated gate field effect transistor. High field and bull effect devices. Theory of quantum mechanics; Time-dependent and time-independent approximation methods; Scattering theory.

PHY 810 Technology and Fabrication of Semiconductor Devices (3 Units)

Formation of PN junction; Formation of oxide and nitride layers on silicon; The photolithographic process; Oxide and nitride layers and diffusion masks; Formation of metal layers; Vacuum deposition; Ohmic contacts; Assemblymethods; Outline of technology of semiconductor diodes, transistors integrated circuits; Evaluation of the technology; in-process texts on finished devices.

PHY 811 Atomic and Molecular Theory (3 Units)

Quantum mechanical description of the hydrogen atom, electron spin, angular momentum vector and interaction; Radioactive transistions; ED approximation probability; Selection rules; The self-consistent field formations and the Hartre-Fork equations; Multiplex structure by Recah methods; Hyperfine couplings and isotope shift; Atoms on crystal lattices; The stark and Zeeman effects; Vibrational-rotational structure of diatomic polyatomic molecules; Molecular orbitals.

PHY 812 Technology of Semiconductor Materials (3 Units)

Methods of single crystal growth; Vacuum deposition of single crystal layers; Impurities and lattice defects in semiconductors. Properties of germanium and silicon and of selected $A^{13}B^{v}$ compounds GaAs, **GaP,** InSb, etc; Behaviour of impurities during crystal growth from the melt, Zone refining, controlled doping, preparation and growth of intermetalic semiconductor crystal; Mechanical electrical and optical characterization of single crystals.

PHY 814 Radio Wave Properties (3 Units) Propagation mechanisms through the troposphere, Radio services; Quantifying propagation performance; Electromagnetic wave radiation, Line-of-sight and transhorizon propagation; Attenuation by atmospheric gases, noise, rain attenuation; Ionospheric propagation; Special

problems of hf radio communication associated with the equatorial ionosphere; Radio noise, Prediction techniques, Calculation and Measurement of field strength, power flux density, radiation and transmission loss.

PHY 815 Non-conventional Energy Sources (3Units)

Conventional and nonm-conventional energy sources; Bio-mass energy, energy storage in plans. Manufacture of synthetic fuel. Desertification and fuel wood conservation; Fossil energy; petroleum exploration; Energy consumption in industry, transportation and other sectors. Nuclear energy, nuclear reactions, nuclear fission and fussion, Reactor design, Efficient use of energy in small and medium forms. Waste utilization and recovery. Energy analysis and optimization; improving efficiency of power plants for production of electric energy. Energy planning.

PHY 816 Antena Theory (3 Units)

Antena: basis, construction and measurements; tuning, gain and radiation pattern measurement. Antena modification, types and characteristics, antenna radiation, reception, currents and polarization. Propagation in free space, effective radiative power, system performance, fading and variability, fading allowances, reliability, worst conditions.

PHY 817 Digital Electronics (3 Units) Switching circuits, Gates, AND, OR, NOR AND NAND gates logic circuit designs. Sum of products and Products-of-sums expression, Karnaugh maps. Flip-flops. Arithmetic circuits, Adder and Substractors. Binary multipliers. Counter and counter application. Memory devices. Introduction to microprocessors and microcomputers.

PHY 818 Control Systems Technique (3 Units)

Control systems, representation, open loop and closed loop control. Transfer function, Steady state and transient behaviour of control system. Stability and sensitivity of control systems. Frequency response methods. Root-loans Method; Control System synthesis. Process control and controllers.

PHY 819 Chaotic Dynamics (3Units)

Concept of phese space, Poincare section, phese diagrams, Basins of attraction, Bifurcation diagrams, Simple chaotic maps: the Logistic map, the circle map, The horsehoe map, characterization of chaotic attractions, Lyapunov exponents, Chaos in fluid dynamics, Lasers, Chaos and quantum physics.

PHY 820 Satellite Technology (3 Units)

The scope and nature of scientific research using vehicles, orbits in a central gravitational field, dynamical requirements for launching earth satellites, rocket propulsion, the tracking of space vehicles; satellite remote Assembly methods; Outline of technology of semiconductor diodes, transistors integrated circuits; Evaluation of the technology; in-process texts on finished devices.

PHY 821 Quantum Mechanics (3 Units)

Quantum Mechanics of one particle system, Quantum mechanics of Heisenberg, Matrix mechincs and transformation theory of quantum mechanics, Theory of angular momentum ans spin, Zeeman effect, Time dependent and time independent approximation methods and application, scattering theory, Dirac equation, low order radiation processes, relativistic quantum mechanics.

PHY 822 Radiation detection and Spectroscopy (3 Units)

Principles of radiation detection. Review of interaction of radiation with matter: Ionizations and excitations. Survey of detector types: Gas-filled, scintillation and semiconductor detectors. Nal (TI) detector characteristics and resolving time. Liquid scintillation analyses, quenching, Solid state (semiconductor) detectors; the HpGe detectors, Photopeak efficiencies and multichannels pulse height analysis. Detectors resolutions. Measurement statistics, Nuclear analytical methods: Thermal and fast neutron activation: neutron sources and neutron reaction cross-sections, energy dependence, resonance. Neutron activation analysis and applications. X-ray fluorescence analysis, the yield equation, sources, domain of application, analytical parameters. Track analysis; principles fission and charge particle tracks, radio measurements. Isotope dilution and solvent extraction methods of radiometric analysis. Principles of the gamma and positron cameras.

PHY 823 Computational Physics (3 Units)

Numerical linear algebra, root finding, approximation theory, integration, ordinary differential equations, optimization techniques, initial and boundary value problems, finite element methods, direct and indirect methods in matrix theory, optimization with constraints analysis of numerical stability, computer programming.

PHY 824 Advance Nuclear and Energy Physics (3 Units)

Review of fundamentals of Nuclear Physics: the nuclear atom (Rutherford's model and the Bohr's modifications); Nuclear properties: nuclear structure and models; nuclear stability; nuclear moment, parity and statistics. Forces between nucleons: deutron, nucleon-nucleon and proton-proton scattering. Nuclear reactions (scattering, collisions): conservation of physical quantities; Q-value determination; cross-sections; the Breit-Wigner formula; excited states of nuclei; nuclear decays: Alpha, beta and gamma decay processes. Theory of decays: quantum mechanical tunneling, the Gamow factor, X-rays following beta decay,the Femi-theory of beta decay. Energetic of gamma decay: internal conversion: position annihilation: isomeric transitions: branching ratios and lifetimes of excited states. Spontaneous fission, Fusion and accelerators Elementary particle physics. Peaceful uses of nuclear energy techniques in Research, Industry, Medicine, Agriculture and the Environment.

PHY 826 Radiation Protection and Dosimetry (3 Units)

Radiation units and quantities. Environmental radiation. Environmental monitoring. Background and artificial sources of exposure. Radiation exposure pathways (external and internal exposures). Review of biological effects of radiation. Radiation risks (health effects). Principles of radiation protection. Legislation of radiation protection. Radiation shielding and protection. Attenuation coefficients and half-value thickness. Waste disposal and decontamination procedures. Principles of dosimetry. Dose conversion factors. Dose limits (for radiation workers and members of the general public). Microdosimetry. Primary and secondary dosimeters. Dose assessment techniques; Experimental, epidemiological and model calculations.

PHY 830 Statistical Mechanics (3 Units)

Statistical distribution functions, Canonical and grand canonical formalism, phase transition and fluctuations, irreversible thermodynamics, Exact transport theory, Principle of equilpartition of energy, Canonical and microcanonical ensembles and their applications, statistical quantum physics, Ising model.

PHY 840 Physics of the Lower Atmosphere (3 Units)

Weather/meteorological parameters and their measurements, Atmospheric thermodynamics, geotropic wind and atmospheric oscillation, atmospheric radiation, cloud Physics and atmospheric electricity, satellite meteorology and remote sensing, Applications to West Africa.

PHY 842 Fluid Dynamics (3 Units)

Kinematics of fluid motion, Euler's equations, Bernoulli equation, steady flow of a compressible fruid, Irotational motion for incompressible flow, gravity waves, waves in incompressible fluid, vortices, energy and momentum relationships, Flow in pipes and open channels, viscous flow, experimental methods in fluid dynamics.

PHY 844 Atmospheric Radiation (3 Units)

Fundamentals of radiation, absorption spectra of water vapour, carbon dioxide, ozone, and oxygen, solar ray path in the atmosphere, Rayleigh and Mie scattering phenomena, direct, diffuse and global irradiance, energy distribution in the solar spectrum outside the atmosphere and at the surface, solar time equation, temporal and spatial variability of solar radiation, theory of thermal radiation in the atmosphere, radiation charts, effects of infrared cooling, radiation balance and climate, Experimental techniques.

PHY 850 Planetary Atmospheres (3 Units)

Basic concepts of the Earth's atmosphere: Atmospheric nomenclature, hydrostatic equations, scale height, geopotential height; chemical concepts of the atmosphere; thermodynamic considerations, elementary chemical kinetics; composition and chemistry of middle atmosphere and thermosphere; thermal balance in the thermosphere; modeling of neutral atmosphere. Dynamics of the Earth's atmosphere: Equation of motion of neutral atmosphere; thermal wind equation; elements of planetary waves; internal gravity waves and atmospheric tides; fundamental description of atmospheric dynamics and effects of dynamics on chemical species. Solar radiation and its effect on atmosphere: Solar radiation at the top of the atmosphere, attenuation of solar radiation in the atmosphere, radiative transfer, thermal effects of radiation, photochemical effects of radiation. Atmosphere of planets and satellites: Inner and outer planets; atmospheric structure and composition of the Moon, Jupiter, Mars, Venus and Saturn and their important satellites.

PHY 852 Ionospheric Physics (3 Units)

Introduction to ionosphere; photochemical processes; Chapman's theory of photoionization; production of ionospheric layers; loss reactios and chemistry of ionospheric regions; morphology of the ionosphere. Ionosspheric propagation and measurement techniques: Effect of ionosphere on radio wave propagation; refraction, dispersion and polarization; magneto-iossnic theory; critical frequency and virtual height; oblique propagation and maximum usable frequency; ground-based techniques – ionosonde; radars scintillations and total electron content (TEC), photometers, imagers and interferometers, ionospheric absorption; rocket- and satellite-borne techniques – Langmuir probe, electric field probe, retarding potential analysers, mass spectrometers, magnetometers, vapour release, satellite drag for neutral density. Ionosspheric plasma dynamics: Basic fluid equations; steady state ionospheric plasma motions owing to applied forces; generation of electric fields; electric field mapping; collision frequencies; electrical conductivity; plasma diffusion; ionospherioc dynamo; equatorial electro-jet; ionospheric modeling. Ionospheres of other planets and satellites. Ionospheres of Mars, Venus and Jupiter.

PHY 854 Physics of Geomagnetic Phenomena (3 Units)

Elements of solar physics: Structure and composition of the Sun, the Sun as a source of radiation; sunspots and solar cycles; solar flares. Magnetic field of the Earth and other planets: Models for generation of geomagnetic fields; secular variations of geomagnetic fields; local elements of geomagnetic fields; determinations of geomagnetic coordinates of stations; Transients various of geomagnetic fields; diurnal variation of geomagnetic fields; geomagnetic pulsations; magnetic fields of other planets. Equatorial anomaly. Magnetosphere of the Earth and other planets: Solar wind and its characteristics; interplanetary magnetic field and sector structure; formation of geomagnetic cavity, magnetopause; magnetospheath and bow shock; polar cusp and magnetotail; plasma sphere and Van Allen radiation belts; magnetosphere of other planets. Geomagnetic field modeling. Aurora and Airglow: Nightglow; dayglow; twilight glow; aurora; applications of airglow measurements for ionospheric dynamics and composition.

PHY 856 Space Weather (3 Units)

Elements of space weather: Geomagnetic storms, sub-storms and current systems; coronal mass ejections; modification of earth's magnetosphere during magnetic disturbances and its implications; effect of magnetic disturbance on high, mid and low latitudes. Measurement techniques for solar and geomagnetic parameters: optical techniques for solar parameters; radio techniques for solar parameters; X-ray; Space Missions. Space Weather Prediction: Modeling of Space Weather parameters.

PHY 858 Satellite Imagery (3 Units)

Overview of remote sensing technology; history and evolution. Electromagnetic radiation and its interaction with matter. Spectral characteristics of crop/vegetation, soils, water etc. Remote sensing platforms, sensors and ground systems. Satellite remote sensing: classification by orbit, application, advantage and disadvantages, type of observation, orbital dynamics. Types of satellites. Overview of Earth observation satellites. Overview of optical infrared (IR) remote sensing sun-synchronous satellites. Overview of polar platforms and meteorological satellites; high-resolution satellites; radar satellites; other missions. Imaging technology. Photogrammetry. GPS: concepts, techniques, systems and applications: GIS concepts, principles and applications; GIS models, GIS components, inputs to GIS; GIS database design and organization; integration in GIS, querying in GIS, GIS outputs and visualization, accuracy of data in GIS, GIS integration errors.

PHY 899 Master's Thesis Research Project (12 Units)

Theoretical/Experimental project supervised by qualified lecturer(s) in the relevant field of interest in the various options (b1-b7) leading to a certified thesis to be defended at the end of the programme.

(C) M.Phil.

PHY 861 Advanced Nuclear and Energy Physics (3 Units)

Review of fundamentals of Nuclear Physics: the nuclear atom (Rutherford's model and the Bohr's modifications); Nuclear properties: nuclear structure and models; nuclear stability; nuclear moment, parity and statistics. Forces between nucleons: deuteron, nucleon-nucleon and proton- proto scattering. Nuclear reactions (scattering, collisions): conservation of physical quantities; Q-value determination; cross-sections; the Breit- Wigner formula; excited states of nuclei; nuclear decays: Alpha beta and gamma decay processes. Theory of decays: quantum mechanical tunneling the Gamow factor. X-rays following beta decay the Fermi theory of beta decay. Energetics of gamma decay: internal conversion: positron annihilation: isomeric transitions: Branching ratios and lifetimes of excited states. Spontaneous fission Fusion and accelerators Elementary particle physics. Peaceful uses of nuclear energy techniques in Research Industry, Medicine, Agriculture and the Environment.

PHY 862 Advanced Electronics (3 Units) Semiconductor diodes, transistors. special power semiconductor devices. Transistor circuits and amplifiers, power distortion, multistage amplifier feed-back and bandwidth. I. C. devices and circuits: I.C: operational amplifiers, phase locked loops, gyrators. turned circuits active filters, detectors, logarithmic generators, variable gain devices; Analysis of circuits for generating, shaping and manipulating waveforms using elements such as line transformers and IC.'s.

PHY 863 Computational Physics (3 Units) Numerical linear algebra, root finding, approximation theory integration, ordinary differential equations, optimization techniques, initial and boundary value problems

finite element methods, direct and indirect methods in matrix theory, optimization with constraints analysis of numerical stability, computer programming.

PHY 864 Antenna Theory (3 Units)

Antenna: basis, construction' and measurements; tuning, gain and radiation pattern measurement. Antenna modifications, types and characteristics; antenna radiation, reception, currents and polarization. Propagation in free space, effective radiative power, system performance, fading and variability, fading allowances, reliability, worst conditions.

PHY 865 Digital Electronics (3 Units)

Switching circuits, Gates, AND, OK NOR and NAND gates logic circuit designs. Sum of products and Products-of.-sums expression, Karnaugh maps. Flip- Flops. Arithmetic circuits, Adder and Subtractors. Binary multipliers. Counters and counter application. Memory devices. Introduction, to digital Computer, operation. Introduction to microprocessors' and microcomputers.

PHY 866 Atmospheric radiation (3 Units)

Fundamentals: of radiation, absorption spectra of water vapour, carbon dioxide, ozone, and oxygen, solar my path in the atmosphere, Rayleigh and Mie scattering phenomena, direct, diffuse and global irradiance, energy distribution in the solar spectrum outside the atmosphere and at the surface, solar time equation, temporal and spatial variability of solar radiation, theory of thermal radiation in the atmosphere, radiation charts, effects of infrared cooling, radiation balance and climate, Experimental technique.

PHY 867 Electrodynamics (3 Units)

Concept of potential and its applications; Single and multiple boundary value problems; The electromagnetic fields energy, forces and momentum relations; Maxwell's equations' solutions of wave equation; Applications to radiating systems, Elements of relativistic electrodynamics, ring charges, classical electron theory

PHY 868 Chaotic Dynamics (3 Units)

Concept of phase space, Poincare section, phase diagrams, Basins of attraction, Bifurcation diagrams, Simple chaotic maps: the Logistic map, the circle map. The horseshoe map, characterization of chaotic Attractors, Lyapunov exponents. Chaos in fluid dynamics, Lasers, Chaos and quantum physics.

PHY 869 Fluid Dynamics 3 Units)

Kinematics or fluid motion, Euler's equations, Bernoulli equation, steady flow of a compressible fluid, irrotational motion for incompressible flow, gravity waves, waves in incompressible fluids, vortices, energy and momentum relationships Flow in pipes and open channels, viscous flow, experimental methods in fluid dynamics

PHY 870 Control Systems Technique (3 Units)
Control systems, representation, open loop and closed loop control. Transfer function, Steady state and transient behaviour of control system. Stability and sensitivity of control systems. Frequency response methods. Root-loans Method; Control Systems synthesis. Process control and controllers.

PHY 871 Physics of Geomagnetic Phenomena (3 Units)

Elements of Solar physics: Structure and composition of the Sun; the Sun as a source of radiation; suns pots and solar cycles; solar flares. Magnetic field of the earth and other planets: Models for generation of geomagnetic fields; secular variations of geomagnetic fields; local elements of geomagnetic fields; determinations of geomagnetic coordinates of stations; Transients variations of geomagnetic fields; diurnal variation of geomagnetic fields; geomagnetic pulsations; magnetic fields of other planets. Equatorial anomaly. Magnetosphere of the Earth and other planets Solar wind and its characteristics; interplanetary magnetic field and sector structure formation of geomagnetic cavity, magnetopause; magnetosheath and bow shock; polar cusp and magnetotail; plasma sphere and Van Allen radiation belts; magnetosphere of other planets. Geomagnetic field modeling. Aurora and Airglow: Nightglow; day glow; twilight glow; aurora; applications of airglow measurements for ionospheric dynamics and composition.

PHY 872 Electronic Measurements and Instrumentation (3 Units)

Errors, Standards, accuracy and calibration; Relationship between specification and circuit performance; Analogue and digital measurements, Transducers and sensors; Signal conditioning, amplification, multiplexing sampling, digital to analogue and analogue to digital conversion. Noise in instrumentation systems; Data indication and recording, storage, Signal electrical and optical characterization of signal crystals.

PHY 873 Physics of the Lower Atmosphere (3 Units)
Weather/meteorological parameters and their measurements, Atmospheric thermodynamics, air stability, geotropic wind and atmospheric oscillation, atmospheric radiation cloud Physics and atmospheric electricity, satellite meteorology and remote sensing Applications to West Africa.

PHY 874 Ionospheric Physics (3 Units)

Introduction to ionosphere; photochemical processes; Chapman's theory of photoionization; production ionospheric layers; loss reactions and chemistry of ionospheric regions; Morphology of the ionosphere, Ionospheric propagation and measurement techniques: Effect of ionosphere on radio wave propagation; refraction, dispersion and polarization; magneto-ionic theory; critical frequency and virtual height; oblique propagation and maximum usable frequency; ground-based techniques-ionosonde; radars; scintillations and total electron content (TEC), photometers, imagers and interferometers, ionospheric absorption; rocket- and satellite borne techniques Langmuir probe, electric field probe, retarding potential analysers, mass Spectrometers, magnetometers, vapour release, satellite drag for neutral density. Ionospheric plasma dynamics: Basic fluid equations; steady state ionospheric plasma motions owing to applied forces; generation of electric fields; electric field mapping; collision frequencies; electrical conductivity; plasma diffusion; ionospheric dynamo; equatorial electrojet; ionospheric modeling. Ionospheres of other planets and satellites. Ionospheres of Mars, Venus and Jupiter.

PHY 875 Properties of Materials (3 Units)

The structure of atoms; Bohr-Rutherford, Wave-mechanical models; Inter-atomic and molecular forces; X-ray crystallography; Crystal imperfections-point defect, line defects, dislocation mechanism of slip, role of dislocation, planar defects, atomic movements in solids.

PHY 876 Physics of Medical Imaging (3 Units)
Fundamentals of Medical Imaging:

Mathematical Methods in Medical Imaging; Tomographic Reconstruction Techniques; Linear Systems; Acquisition, formation, processing and display of medical images; Perception; Evaluation of Image Quality

Physics of Imaging Detectors (Basics): Introduction to Poisson statistics; Physics of generic photon detectors (Quantum efficiency -Direct conversion detectors, Charge generation and charge collection Indirect conversion detectors); Scintillators (Integrating detectors, Counting detectors, Spectroscopic detectors); Sampling (Space, Time); Noise considerations (Signal to noise ratio); Photon transfer curve; Concept of spatial frequency depending detective quantum efficiency (Integrating detectors, Counting detectors)

PHY 877 Radiation detection and Spectroscopy (3 Units)

Principles of radiation detection. Review of interaction of radiation with matter: Ionizations and excitations. Survey of detector types: Gas-filled, scintillation and semiconductor detectors. NaI(Tl) detector characteristics and resolving

time; Liquid scintillation analyses, quenching. Solid state (semiconductor) detectors. Photopeak efficiencies and multichannel: pulse height analysis. Detectors resolutions. Measurement statistics. Nuclear analytical methods: Thermal and fast neutron activation; neutron sources and neutron reaction cross-sections, energy dependence, resonance. Neutron activation analysis and applications. X-ray florescent analysis, the yield equation, sources, domain of application, analytical parameters. Track analysis; principles; fission and charged particle tracks, radon measurements. Isotope dilution and solvent extraction methods of radiometric analysis. Principles of the gamma and positron cameras.

PHY 878 Methods of Mathematical Physics (3 Units) Techniques for the solution of Boundary value problems, use of Green's functions, integral Equations; Vector Spaces, Tensor Transformations; Materials; Complex variable theory, Groups Representations and symmetry.

PHY 879 Radio Wave Propagation (3 Units)

Propagation mechanisms through the troposphere, Radio services, Quantifying propagation performance. Electromagnetic wave radiation, Line-of-sight and transhorizon progagation. Attenuation by atmospheric gases, noise, rain attenuation. Ionospheric propagation, Special problems of hf radio communication associated with the equatorial ionosphere. Radio noise, Prediction techniques, Calculation and Measurement of field strength, power flux density, radiation and transmission loss.

PHY 880 Planetary Atmosphere (3 Units)

Basic concepts of the Earth's atmosphere: Atmospheric nomenclature, hydrostatic equations, scale height geopotential height; chemical concepts of the atmosphere; thermodynamic considerations, elementary chemical kinetics; composition and chemistry of middle atmosphere and thermo ere; thermal balance in the thermosphere; modeling of neutral atmosphere. Dynamics of the Earth's atmosphere: Equation of motion of neutral atmosphere; thermal wind equation; elements of planetary waves; internal gravity waves and atmospheric tides; fundamental description of atmospheric dynamics and effects of dynamics on chemical species. Solar radiation and its effect on atmosphere: Solar radiation at the top of the atmosphere, attenuation of solar radiation in the atmosphere, radiative transfer, thermal effects of radiation, photochemical effects of radiation. Atmospheres of planets and satellites: Inner and outer planets; atmospheric structure and composition of the Moon, Jupiter, Mars, Venus and Saturn and their important satellites.

PHY 881 Statistical Physics (3 Units)

Statistical distribution functions Canonical and grand canonical formalism phase transition and fluctuations, irreversible thermodynamics Exact transport theory Principle of equipartition of energy. Canonical and microcanonical ensembles and their applications statistical quantum physics, Ising model.

PHY 882 Physics of Nuclear Medicine (3 Units) Introduction to Nuclear Medicine. Basics of Atomic and Nuclear Physics. Modes of Radioactive Decay. Decay of Radioactivity. Radionuclide production. Interactions of Radiation with Matter. Radiation Detectors. Visible Light detectors. Nuclear Radiation Measurements – Scintillation

Counting Systems. Nuclear Radiation Measurements – Pulse-Height Spectrometry. Gamma camera –

Basic Properties. Gamma camera – Performance Characteristic. Tomographic Reconstruction in

Nuclear Medicine. Single Positron Emission Tomography (SPECT). Positron Emission Tomography

(PET). radiopharmaceuticals for Radiotherapy. Internal radiation Dosimetry. Glucose metabolism at the cellular level and Wartburg effect

PHY 883 Physics of Diagnostic and Interventional Radiology (3 Units)

X-Ray: Overview of Imaging Modalities (ionizing and non-ionizing); X ray Imaging (Generation of x-rays , x-ray spectra, Detectors, Image Parameters, Image quality, Noise, contrast, resolution, Radiographic, Mammography, Fluoroscopic, CT, DECT, Tomosynthesis, Interventional Radiology, Dual energy imaging and absorptiometry, Patient dose and system optimization); Dual and Multi-modality Imaging; Quality Management of Diagnostic and Intervention al Radiology

Ultrasound Imaging: Acoustic properties of biological tissues; Wave, motion and propagation, acoustic power; Modes of Scanning; Transducers; Doppler; Safety.

Magnetic Resonance Imaging (MRI): Physics of Magnetic Resonance; MR Image formation; MR Instrumentation; MRI methods; MR contrast and image quality; Clinical app lications and artefacts; Safety

PHY 884 Quantum Mechanics (3 Units)

Quantum mechanics of one particle system, Quantum mechanics of Heisenberg, Matrix mechanics and formation theory of quantum mechanics, Theory of angular momentum and spin, Zeematl effect, Time dependent and time independent approximation methods and applications, scattering theory, Dirac equation, low order radiation processes, relativistic quantum mechanics.

PHY 885 Physics of Radiation Oncology (3 Units)

Overview of clinical radiotherapy, Radiation therapy equipment (accelerators, cobalt 60, cyclotrons, kV generators); Basic photon radiation therapy (dosimetric functions, etc.); Basic treatment planning; Simulation, virtual simulation, DRR's, image registration; Patient setup, including positioning and immobilization; ICRU Reports 50, 62 and 83; Basic electron radiation therapy, ICRU Report 71; Kilovoltage radiotherapy; Dose calculation algorithms

and heterogeneity corrections; Brachytherapy, ICRU Report 38 , AAPM TG 43 formalism (HDR/LDR, Equipment, Treatment Planning); Inverse Planning, optimization, IMRT; Small field dosimetry (fundamental aspects, protocols); Small-field radiotherapy equipment and techniques (Stereotactic Radiotherapy and Radiosurgery, Stereotactic Body Radiotherapy, Intensity Modulated Radiotherapy; Image guidance and verification in radiotherapy (Cone beam CT, ultrasound, Portal imaging, in-vivo dosimetry, image registration); Radiation therapy information systems; Acceptance testing and commissioning; Quality management of radiotherapy

PHY 886 Radiation Protection and Dosimetry (3 Units)

Radiation units and quantities. Environnemental radiation. Environmental monitoring. Background and artificial sources of exposure. Radiation exposure pathways (external and internal exposures). Review of biological effects of radiation. Radiation risks (health effects). Principles of radiation protection. Legislation of radiation protection. Radiation shielding and protection. Attenuation coefficients and half-value thickness. Waste disposal and decontamination procedures. Principles of dosimetry. Dose conversion factors. Dose limits (for radiation workers and members of the general public). Microdosimetry. Primary and secondary dosimeters. Dose assessment techniques;

Experimental epidemiological and model calculations.

PHY 887 Radiation Physics (3 Units)

Review of modern physics and elementary quantum mechanics, Coulomb scattering, Elastic scattering, Rutherford, Multiple scattering: Moli re, Goudsmit-Saunderson, Scattering power, Atomic structure and models, Production of x-rays, Photon interactions - exponential attenuation, Thomson scattering, Compton Scattering, Rayleigh scattering, Photo-electric effect, Pair production, Annihilation, Photonuclear reactions, Overview of neutron interactions, Energy transfer and energy absorption, Stopping power for protons & electrons, Transport equation and Monte Carlo Techniques for radiation transport, introduction, Radiation dosimetry concepts, exposure, air kerma, CPE, Radiation Standards for air kerma and absorbed dose, Fricke dosimetry, Calorimetry, Cavity theory, Ionization chambers, recombination and polarity theory, gas concept and calibration chain

PHY 888 Solid State Theory (3 Units)

Symmetry and group theory; Electron States, Self-consistent field approximations methods; the Femi surface; Semiconductors and metals, the Kronig-Penny model, Dynamics of electrons and holes in semiconductors. Insulator bands, Impurity states; Scattering by resonance and impurities; Electronic properties, Thermodynamic, transport, semiconductor systems, screening, Dielectric properties; Optical properties; Lattice vibrations; Phonon and the lattice specific heat; Electron-phonon interactions. Superconductivity. Density functional theory and its applications. PN junction theory, homo and heterojunctions, metal-semiconductor junction; General characteristics and physical limitations of bipolar transistor; Relation of physical properties to electrical characteristics; Theory of junction- field effect transistor; Theory of insulated gate transistors; properties of the metal-oxide; semiconductor system and its applications in insulated gate field effect transistor. High field and bull effect devices. Theory of quantum mechanics; Time-dependent and time-independent approximation methods; Scattering theory. optimization; improving efficiency of power plants for production of electric energy. Energy planning.

PHY 889 Applied Dosimetry (3 Units)

Introduction to radiation therapy and dosimetry; percent depth dose curves. Radiation therapy equipment: Therapy devices; source-to-surface distance vs. source-to-axis distance; linear accelerator components. Linear accelerator components; other medical accelerators; beam quality definition. Measurement dosimetry: Calibration chain; absolute dosimeters; relative dosimeters; review of cavity theory. Air kerma based dosimetry. Absorbed dose to water based dosimetry, Dosimetric functions: Equivalent field size; inverse-square law; collimator factor; scatter factor; relative dose factor; peak scatter factor. Output at reference conditions; tissue-air ratio; scatter-air ratio; relationship between PDD and TAR; Mayneord factor. Tissue-phantom ratio; tissue-maximum ratio; relationship between PDD and TPR Calculation of dose to water under changing conditions (field size, SSD, depth) using PDD and TPR methods; monitor unit calculations for SSD and SAD setups. Treatment planning: Off- axis ratios; beam profiles; flatness and symmetry; isodose lines; dose distributions for single and multiple fields. Missing tissue compensation; wedges; bolus; compensators. Dose-volume histograms; beam weighting; dose normalization; radiotherapy prescriptions. CT simulation; digitally-reconstructed

Radiographs: Electron therapy: PDD; beam quality; practical range; low vs. high energies; virtual

source; electron cutouts. Field matching; effect of obliquity; shielding; total skin electron irradiation; electron arc therapy; bolus; electron prescriptions. Kilovoltage radiotherapy: Free-air chambers; kilovoltagedosimetry; historical applications; current clinical applications

PHY 890 Space Weather (3 Units)

Elements of space weather: Geomagnetic storms, sub-storms and current systems; coronal mass ejections; modification of the Earth's magnetosphere during magnetic disturbances and its implications; effect of magnetic disturbance on high, mid, and low latitudes. Measurement techniques for solar and geomagnetic parameters: Optimal techniques for solar parameters; ratio techniques for solar parameters; X-ray; Space Missions. Space Weather Prediction: Modeling of Space Weather parameters.

PHY 891 Technology and Fabrication of Semiconductor Devices (3 Units)

Formation of PN junction, Formation of oxide and nitride layers on silicon, The photolithographic process; Oxide and nitride layers and diffusion masks, Formation of metal layers, Vacuum deposition. Ohmic contacts, Assembly methods, Outline of technology of semiconductor diodes, transistors, integrated circuits, Evaluation of the technology; in-process texts on finished devices.

PHY 892 Satellite Imagery (3 Units)

Overview of remote sensing technology: history and evolution. Electromagnetic radiation and its interaction with matter. Spectral characteristics of crops/vegetation, soils, water etc, Remote sensing platforms, sensors and ground systems. Satellite remote sensing: classification by orbit, applications, advantages arid disadvantages, type of observation, orbital dynamics. Types of satellites. Overview of Earth observation satellites. Overview of optical infrared (IR) remote sensing sun-synchronous satellites. Overview of polar platforms and meteorological satellites; high resolution satellites; radar satellites; other missions. Imaging technology. Photogrammetry. GIS concepts, techniques, systems and applications. GIS: concepts, principles and applications: GIS models, GIS components, inputs to GIS; GIS database design and organization; integration in GIS querying in GIS, GIS outputs and visualization, accuracy of data in GIS, GIS integration.

PHY 893 Technology of Semiconductor Materials (3 Units)

Methods of single crystal growth; Vacuum deposition of single crystal layers. Impurities and lattice defects in semiconductors. Properties of germanium and silicon and of selected A_3B_v compounds, GaAs, GaP, InSb, etc. Behaviour of impurities during crystal growth from the melt. Zone refining controlled doping, preparation and growth of inter-metalic semiconductor crystal. Mechanical, electrical and optical characterization of single crystals.

PHY 894 Non Conventional Energy Sources (3 Units)

Conventional and non-conventional energy sources; Bio-mass energy, energy storage in plans. Manufacture of synthetic fuel. Desertification and fuel wood conservation, Fossil energy, petroleum exploration. Energy consumption in industry, transportation and other sectors. Nuclear energy, nuclear reactions, nuclear fission and fusion, Reactor design, Efficient use of energy in small and medium forms. Waste utilization and recovery. Energy analysis and optimization; improving efficiency of power plants for production of ele ctric energy. Energy planning.

PHY895 Atomic and Molecular Spectroscopy (3 Units)

The hydrogen atom, the Bohr's theory, the Bohr-Sommerfeld theory, the energy of elliptical orbits. The Relativistic correction and its effects. Electron spin and the vector model of the atom. Identical particles and symmetry. Many-electron atoms, coupling scheme. The diatomic molecule, hyperfine structure, Zeeman effects, Frand-Condon principle. Properties of x-rays. Microwave Spectroscopy, resonance phenomena, nuclear magnetic resonance (NMR), ES, optical pumping and Mossbauer Effect.

PHY 896 Nano Science and Technology (3 Units)

Introduction and classification; concept of nanoscience, nanomaterials and nanoscale. Description of nanomaterials; bottom-up, top-bottom, quantum mechanics of nanodimension (quantum dot).

Statistics of small essembles; molecular transport and thermodynamics. Nanoscale momentum and energy transfer; ballistic/diffusive transport. Surface and interface interactions; adhesion, surface tension, lubrication. Nanophase materials; design, synthesis and characterization. Nanodevice thermal and fluiding managements. Nanoscale biometic devices and system. Nanoscale sensing; nanometrology and actuation. Nanosystem energy conversion. Nano-manufacturing; challenges and opportunities.

PHY 897 Computers in Medical Imaging (4 Units)

Computers and networking: Introduction to computer systems and networks. General computer network concepts and terminology. Computer components and software. Operating systems. Network types and models. **Physical media for networks.** Different types of network media. Use of each medium and combinations. **Data link layer.** Error correction. Polynomial (CRC) checking code. Data link protocols. **Medium access sublayer** Collision detection and CSMA. Ethernet and IEEE 802.3. Other networks. And protocol comparisons. Switches and bridges. Troubleshooting hardware issues. **Network layer.** Static and dynamic routing. Internet protocol. IP address space. Classes of IP addresses. Gateways. ARP and RARP. DHCP. Subnets and routing tables. Troubleshooting IP problems. **Transport layer.** Functions of the transport layer. TCP and ports. UDP. **Application layer**. Name resolution. Network applications (FTP, email, security and firewall). **Clinical software and applications**. Imaging applications and image file formats. DICOM and DICOMRT standard and exchange. PACS. HL7. Relational databases.

Computer programming: Review of Computer Hardware/Software brief history. Programming

Languages (PL). PL Building Blocs (variables, Data types and expressions, looping, making decisions, arrays, functions, logic language/flow chart). Algorithm design (Diagram/flow chart). Type and Choice of language. Graphical User Interfaces GUIs. Intro to Real Basic language IDE. **Example projects**: memory handling, array and variables, I/O concepts, binary vs. text files, file type,

structure/class organization, object-oriented programming concept (OOP), GUI design. **More**

example projects: advanced graphics, threading, shell calls, RNG, numerical methods, sampling techniques, etc...

PHY 900 Master's of Philosophy Research Project (6 Units)

Theoretical/Experimental project supervised by qualified lecturer(s) in the relevant field of interest in the various options leading to a certified thesis to be defended at the end of the programme.

(d) Ph.D.

PHY 999 Doctoral Research Project

The candidate is expected to undertake a research project of interest in any field of physics. The candidates is expected to deliver three seminars on the proposal and on the research project undertaken.

LIST OF ACADEMIC STAFF IN DEPARTMENT OF PHYSICS

S/N	NAME	STATUS	AREA OF SPECIALIZATION	E-mail/Phone Number
1.	Prof. E. O. Ogolo	Professor	Atmospheric Physics/Meteorology	emogo@yahoo.com 08033897139
2.	Prof. (Mrs) I. A. Fuwape	Professor	Condensed Matter Physics/Theoretical Physics	yfuwape@yahoo.com 08033573773
3.	Prof. M.O. Ajewole	Professor	Communication Physics	oludare.ajewole@futa.edu.ng 08034550871
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14.	Prof.. Y. A. Odusote	Professor	Condensed Matter Physics	yaodusote@futa.edu.ng 08037142446
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24.	Dr. A. G. Ashidi	Senior Lecturer	Communication Physics	agashidi@futa.edu.ng 08038708144
25.	Dr. O. A. Layioye	Lecturer II	Communication Physics	oalayioye@futa.edu.ng 09031335626
26.	Dr. (Mrs) A. F. Afolabi	Lecturer II	Condensed Matter Physics	afafolabi@futa.edu.ng 07030614850
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9.10.4 DEPARTMENT OF STATISTICS

REVISED CURRICULUM FOR POSTGRADUATE DIPLOMA (PGD) PROGRAMME IN STATISTICS

1. PROGRAMME OFFERED: Postgraduate Diploma (PGD) in Statistics

2. PROGRAMME PHILOSOPHY

The postgraduate diploma in Statistics is designed basically for university graduates with limited statistics background who wish to further their knowledge in Statistics and also to serve as a bridge for HND statistics graduates who might wish to improve on their academic and professional qualification. The course will provide students with a solid foundation in advanced statistical theory and methodology that are needed in social and applied sciences.

3. **PROGRAMME OBJECTIVES**

The objectives of the programme are to:

i) develop and give academic and professional training in all areas of Statistics for the development of latent power of thinking in individuals;

ii) provide and promote sound basic practical and theoretical training in Statistics as foundation for research and technological development in Nigeria;

iii) give practical experience of gathering, processing, interpreting and presenting statistical ideas or information; and

iv) give opportunity for Statistics graduates that intend to make up for deficiencies in their academic background to qualify to pursue higher degrees or practice as a professional Statistician

4. PROGRAMME JUSTIFICATION

The dynamic nature of statistical training makes it crucial to conduct periodic review of its curriculum. The field of statistics has continued to witness increasing expansion as new areas and new techniques are developed. In addition, demand for products of the programme has risen in recent times. In view of the above considerations, the Department of Statistics is proposing to review the PGD Statistics programme to bring it in tune with the University wide goal of enhancing the relevance of course and repositioning the University as a center of excellence.

5. ADMISSION REQUIREMENTS

Candidates for admission to the postgraduate diploma programme in Statistics shall be holders of:

i) B.Tech degree of the Federal University of Technology, Akure (FUTA) or any other recognized University not below third Class degree in any other related discipline.

ii) Higher National Diploma (HND) in Statistics or any other related discipline with a minimum of lower credit.

6. PROGRAMME DURATION

The programme is expected to run on a full-time basis for a minimum of three (3) semesters and a maximum of five (5) semesters.

7. GRADUATION REQUIREMENTS

To be eligible for the award of the PGD in Statistics, a candidate must have:

i. passed all core courses and successfully completed the project work
ii. passed a minimum of 45 credit units, made up as follows:
iii. 24 credit units in core courses
   a) 15 credit units in elective courses
   b) 6 compulsory credit units of research project

8. **COURSE OUTLINE**

FIRST SEMESTER (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 701	Statistical Methods	2	1	0	3
STA 703	Probability and Distribution Theory	2	1	0	3
STA 705	Statistical Inference I	2	1	0	3
	At least two elective courses	4	2	0	6
Total					15

FIRST SEMESTER (Electives courses): Students are to take at least 6 credit course units

COURSE CODE	COURSE TITLE	L	T	P	U
STA 711	Operations Research	2	1	0	3
STA 713	Econometric Methods	2	1	0	3
STA 715	Official Statistics	2	1	0	3

SECOND SEMESTER (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 702	Statistical Computing	1	0	6	3
STA 704	Design and Analysis of Experiment	2	1	0	3
STA706	Statistical Inference II	2	1	0	3
	At least two Elective Courses				6
Total					15

SECOND SEMESTER (Electives courses): Students are to take at least 6 credit course units

COURSE CODE	COURSE TITLE	L	T	P	U
STA 708	Non-Parametric Methods	2	1	0	3
STA 710	Stochastic Processes	2	1	0	3
STA 712	Demographic Methods	2	1	0	3
STA 714	Statistical Quality Control	2	1	0	3

THIRD SEMESTER (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA707	Sample Survey and Sampling Techniques	2	1	0	3
STA709	Multivariate Analysis	2	1	0	3
STA 799	Project	0	0	18	6
	At least One Elective Course				3
Total					15

THIRD SEMESTER (Electives courses): Students are to take at least 3 credit course units

COURSE CODE	COURSE TITLE	L	T	P	U
STA 717	Time Series Analysis	2	1	0	3
STA 719	Biometry	2	1	0	3
STA 721	Categorical Data Analysis	2	1	0	3

9. COURSE SYNOPSES

STA 701 – Statistical Methods (3 units)
Population and sample. Sampling distribution. The Chi-Square, student t, T, F and normal distributions. Point and Interval estimations for proportion and mean under one and two populations (large and small sample cases). Hypothesis testing: null and alternate hypothesis; simple and composite hypothesis; Type I and Type II errors; tests for proportions and means; matched pairs test. Contingency table. Goodness of fit tests. Simple correlation and Regression Analysis; Analysis of variance.

STA 702 – Statistical Computing (3 units)
Statistical database management. Practical exercises designed to give the students experience of real-life data analysis using the following packages: SPSS, S-PLUS, R, Stata, EPI – INFO, GENSTAT, STATISTICA, and E-VIEWS.

STA 703 – Probability and Distribution Theory (3 units)
Sample Space, Algebra of Sets, Axiomatic definitions of Probability, Conditional Probability and Independence, Bayes theorem, Random Variables and their distributions. Moment and Probability generating functions. Some special distributions, Marginal and Conditional distributions, Multivariate Continuous distributions of functions of random variables and some derived distribution. Limit theorems and limiting distributions. The law of large numbers

STA 704 - Design and Analysis of Experiments (3 units)
Principles of experimentation. Analysis of Standard designs: CRD, RCBD, Latin Square designs, incomplete designs (BIBD and PBIBD), Nested designs and other crossed classification designs, Comparison of the various designs, Post hoc; LSD, Tukey, Scheffe etc. Factorial experiments, Confounding and fractional replication

STA 705 - Statistical Inference I (3 units)
Point and Interval estimation methods. The methods of Maximum likelihood, Methods of Moments, Least Square Methods, Criteria and Properties of estimates, Unbiaseness, Efficiency, Sufficiency and Completeness. Tests of hypothesis, power function, Neyman –Pearson lemma, likelihood ratio and sequential tests.

STA 706 – Statistical Inference II (3 units)
Unbiased estimation. Crammer-Rao Inequality and its generalizations. Bhattacharya bounds. Sufficient Statistics. Rao-Black well theorem. Complete Statistics.

Halmos theorem on uniformly minimum variance estimation. Maximum likelihood estimators. Linear estimation. Minimum risk and Bayes estimation. Admissible and minimax estimators using quadratic loss. Invariant estimators. Interval estimation, randomized and non-randomized tests. Most powerful and uniform most powerful tests. Unbiased tests and Confidence Intervals, completeness and similarity likelihood ratio test. Invariant test

STA 707 Sample Survey and Sampling Techniques (3 units)
Construction and choice of strata, frames and various equal and unequal probability sampling schemes with properties. Estimation of means, proportion and their variances. Successive sampling scheme. Problems of non-sampling error and non-response: application to some selected specialized survey. Survey designs: simple random sampling, stratified random sampling, cluster sampling, multistage sampling, Systematic sampling, theory of estimation, sampling with probability proportional of size ratio and regression estimates, optimisation techniques for minimum variance.

STA 708– Non-Parametric Methods (3 units)
Advantages and Disadvantages of Non-Parametric Statistical Tests; Order statistics and their distributions, Kolmogorov type of test statistics. Common Non-parametric tests: One sample case: Binomial test, Chi-square test for randomness, Runs test and test for independence of series. Two sample case: The case of paired samples; Sign test, Wilcoxon Matched-Pairs Signed- Ranks Test. The case of two independent samples: Median tests, Chi – Square Test; Wald-Wolfowitz test and Wilcoxon test. K independent samples case: Median test, Kruskal-Walls H test. Non-parametric measures of distributions and their approximations. Efficiency properties. Estimates based on test statistics.

STA 709 – Multivariate Analysis (3 units)
Vector random Variables, Linear and Stochastic independence, Expectations of quadratic Forms, Multivariate normal distribution, linear and quadratic Forms, Wishart and Hotelling T^2 distributions, Wilk's lambda, Noncentral F, t and x^2 distributions, Estimation of mean vector and Covariance matrix, Maximum likelihood, Likelihood ratio and the union intersection principles, Simultaneous confidence intervals, partial and multiple correlation, Estimation, Distribution and Testing.

STA 710 Stochastic Processes (3 units)
Random phenomena in time and space, Markov chains in discrete and continuous time, Classification of states, Stationary distributions, Branching processes, Renewal theory including regenerative processes and Semi-Markov processes, Brownian motion and stationary processes, queuing theory.

STA 711 – Operations Research (3 units)
Deterministic and Probabilistic models. Linear programming methods, non-linear integer and dynamic programming with applications inventory and stock control. Application of stochastic processes e.g. queuing theory or Simulation techniques, Games theory and network analysis, Transportation problem, Markov chain, Application of decision analysis in dynamic programming, competitive and search problems

STA 712 Demographic Methods (3 units)
Introduction to Demography. The Life table. The Matrix Model Framework. Sources and reliability of population. Statistics development of census and vital statistics. Interpretation of population statistics. Vital registration, social and economic classifications in census. Sources and limitations of data on disease incidence and prevalence. National morbidity surveys. Measures of fertility, mortality, morbidity and nuptiality. Mortality comparison: the male –female ratio, fixed regime of mortality and fertility, stable theory. Birth, population increase and reproductive value from the life table and matrix population models

STA 713 – Econometric Methods (3 units)
Introduction to linear and general economic models and multiple regression on economic situations, Single equation, non-linear models, Simultaneous equations econometric models, Time Series models, Model building and fitting, Auto-regression models, Application of models in production and consumption and models of nation and economy.

STA 714 - Statistical Quality Control (3 units)
Quality assurance in modern business. Total quality management (TQM): philosophy, tools and principles. Control charts for attributes and variables; p, np, c, u, $\bar{x}$, R, and s charts. Sampling Inspection activities; Sampling Plan, Operating Characteristic curve, Determination of Risk: Acceptable Quality Level, Producer's Risk, Limiting Quality, Lot Tolerance Percent Defective, Consumer's Risk. Choice of Sample size; Average Outgoing Quality (AOQ); Non-Binomial Sampling. Tolerance Limits; Sampling by attributes, Sampling by Variables. Sequential sampling plan. Process capability analysis. Evolutionary operations

STA 715 – Official Statistics (3 units)
Collection and analysis of data arising from economic and social planning. The methods of analyses will include the parametric and nonparametric statistical methods. Source and Nature of Official Statistics like economic, social, population (birth, death, emigration and immigration), education and so on, Problems in collecting and analysis of these data.

STA 717 – Time Series Analysis (3 units)
Basic Time series concept; general stationary, non-stationary models, Autoco-variance and auto correlation functions. Stationary, non-stationary autoregressive integrated moving average models. Frequency-based techniques of time series analysis, Spectral theory. Forecasting in linear models,

STA 719- Biometry (3 units)
Biological assays; direct assays. Dose response relationship. Multiple assays, statistical analysis of DNA sequences. MANOVA, splits plot design. ANOVA Factorial design, Post-hoc tests, Model for categorical repeated measurement. Multivariate Analysis: additive main effects and multiplicative interaction model. Various methods of analyzing biological and agricultural data.

STA 721 Categorical Data Analysis (3 units)
One-Way Classification. The Multinomial Distribution. Test Statistics for testing the null hypothesis, Goodness-of-Fit test. Models for 2 x 2 contingency tables. Measures of association in 2 x 2 Contingency Tables. The hypergeometric probability model, Fisher's exact test. The full multinomial model scheme. The 2 x 2 tables with correlated data. Log- linear models for contingency tables. Models in Ordinal Contingency Tables. Analysis of Doubly Classified Data. Analysis of Repeated Measures Data. Odds ratio, Log-odds ratio. Measure of sensitivity, specificity, and predictive accuracy of some models.

STA 799 PGD Research Project (6 units)
Candidates shall be required to submit a written project report under staff supervision to the department for examination

1. **PROGRAMME OFFERED:** Doctor of Philosophy (Ph. D.) in Statistics
2. **AVAILABLE OPTIONS/SPECIALIZATIONS**
   i. Biometry
   ii. Econometrics and Financial Statistics
   iii. Computational Statistics and Operations Research
   iv. Spatial and Environmental Statistics
   v. Statistical Design and Investigations

3. PROGRAMME PHILOSOPHY
The programme is designed to equip students with adequate knowledge and skills in
Statistics with focus on advanced theoretical and practical training to ensure the attainment of desired intellectual development and competence in solving real life problems.

4. PROGRAMME OBJECTIVES
The objectives of the programme are to:
i) develop and give advanced academic and professional training (practical and theoretical) in all areas of Statistics for the purpose of job placement in the industries and to be self-employed and create jobs;
ii) expose the students to current research and up-to-date methodologies in Statistics, and increase their understanding of the applications of statistical methodology to solve real-life problems in areas of agriculture, commerce, industry, medicine and other disciplines that require the knowledge of Statistics; and
iii) develop manpower that is research-oriented in the area of Statistics for the sustenance of teaching and research in both public and private institutions of higher learning and non-governmental organizations.

5. **PROGRAMME JUSTIFICATION**
The dynamic nature of statistical training makes it crucial to conduct periodic review of its curriculum. The field of statistics has continued to witness increasing expansion as new areas and new techniques are developed. Hence, the courses have to be in tune with the latest developments in the subject and also take cognizance of the newer methods of statistical analysis which are now totally computerized. In addition, demand for products of the programme has risen in recent times because of the increase in the number of private and public tertiary institutions offering statistics in the country. The graduates of the programme provide the requisite manpower for these institutions. Thus, it has become inevitable to make the programme respond to the needs of both academic researchers and practicing statisticians in training institutions and industries.

6. ADMISSION REQUIREMENTS
Candidates seeking admission into the Ph.D. programme are required to possess:

i) M. Tech degree in Statistics of FUTA or any other recognized University with a minimum CGPA of 3.5 on 5-point credit scale or have a minimum overall score of 60%

ii) M. Phil degree in Statistics of FUTA or any other recognized University with a minimum CGPA of 3.5 on 5-point credit scale or have a minimum overall score of 60%

7. PROGRAMME DURATION

The Ph.D. programme shall run for a minimum of 36 months and a maximum of 48 months of intensive research for full time and a minimum of 48 months and a maximum of 60 months for part-time students.

8. **GRADUATION REQUIREMENTS**

To be eligible for the award of Ph.D. in Statistics, a candidate must have carry out an independent research work in his/her specialization under the general supervision of selected senior academic staff in the chosen field of research. The candidate must demonstrate high scholastic ability through the research. The thesis emanating from the research should exhibit originality and the result must form distinct contributions to knowledge. In carrying out this main requirement,

i) A candidate must, in consultation with his/her supervisors, present a comprehensive research proposal and a proposal seminar in the department successfully within the first year of study
ii) As in 8(i), a candidate must present progress seminars in the department successfully
iii) On completion of the research, the candidate must present an end-of-thesis seminar successfully in the department
iv) fulfilled all other conditions as approved by the School of Postgraduate Studies and the University
v) A candidate after carrying out satisfactorily post seminar review, must submit the required number of copies of thesis for a viva; and pass satisfactorily the oral examination of the submitted thesis before a panel of examiners.

CURRICULUM FOR MASTER OF TECHNOLOGY [M.TECH.] PROGRAMME IN STATISTICS

1. PROGRAMME OFFERED: Master of Technology (M. Tech) in Statistics

2. **AVAILABLE OPTIONS/SPECIALIZATIONS**

i) Biometry
ii) Econometrics and Financial Statistics
iii) Computational Statistics and Operations Research
iv) Spatial and Environmental Statistics
V) Statistical Design and Investigations

3. PROGRAMME PHILOSOPHY

The programme is designed to equip students with adequate knowledge and skills in Statistics with focus on advanced theoretical and practical training to ensure the attainment of desired intellectual development and competence in solving real life and industrial problems.

4. PROGRAMME OBJECTIVES

The objectives of the program are to:

i) develop and give academic and professional training in all areas of Statistics for the development of latent power of thinking in individuals;
ii) provide and promote sound practical and theoretical training in Statistics as foundation for research and technological development and for the purpose of job placement in Nigeria;
iii) develop manpower that can identify the basic scientific and technological problems in area of Statistics and find appropriate solutions to them; and
iv) provide students with adequate knowledge in Statistics to solve real-life problems in areas of agriculture, commerce, industry, medicine and other disciplines that require the knowledge of Statistics.

5. **PROGRAMME JUSTIFICATION**

The dynamic nature of statistical training makes it crucial to conduct periodic review of its curriculum. The field of statistics has continued to witness increasing expansion as new areas and new techniques are developed. Hence, the courses have to be in tune with the latest developments in the subject and also take cognizance of the newer methods of statistical analysis which are now totally computerized. In addition, demand for products of the programme has risen in recent times because of the increase in the number of private and public tertiary

institutions offering statistics in the country. The graduates of the programme provide the requisite manpower for these institutions. Thus, it has become inevitable to make the programme respond to the needs of both academic researchers in training institutions and practicing statisticians in industries.

6. ADMISSION REQUIREMENTS:

To be eligible for admission, candidates must possess any one of the following:

i. B. Tech degree in Statistics from FUTA or any other recognized University with a minimum of Second Class Lower Division, or
ii. Bachelor's degree in Mathematics, Computer Science or Economics from FUTA or any other recognized University with a minimum of Second Class Upper Division and sufficient background in Statistics may be considered.
iii. HND in Statistics with a minimum of upper credit plus a PGD in Statistics from FUTA with a minimum of upper credit (CGPA of 3.5/5.0)

7. PROGRAMME DURATION

The M. Tech. in Statistics programme is expected to last for a minimum of 18 months and a maximum of 24 months for full time students only.

8. GRADUATION REQUIREMENTS

To be eligible for the award of M. Tech. Degree in Statistics, a candidate must have:

i) passed all core courses and successfully completed the project work
ii) passed a minimum of 46 credit units, made up as follows:
   a) 34 credit units in core courses including seminars and dissertation depending on the options 2(i)- (v)
   b) 12 credit units in elective courses from the major area of specialization.

In addition, the candidate after carrying out satisfactorily a supervised project in any chosen specialization area of Statistics, must submit the required number of copies of dissertation; and pass satisfactorily an oral examination on the dissertation before a panel of examiners

9. COURSE OUTLINE

First Semester (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 801	Advanced Probability and Distribution Theory	2	1	0	3
STA 803	Non Parametric Inference and Sequential Methods	2	1	0	3
STA 805	Advanced Statistical Computing	1	0	6	3
STA 815	Advanced Experimental Design I	2	1	0	3
	At least six credit units of elective courses				6
Total					18

First Semester (Electives courses): Students are to take at least 6 credit course units

(i) Biometry

COURSE CODE	COURSE TITLE	L	T	P	U
STA 809	Survival Analysis	2	1	0	3
STA 827	Environmental Statistics	2	1	0	3
STA 831	Statistical Ecology	2	1	0	3
STA 833	Biometric Methods	2	1	0	3

(ii) Econometrics and Financial Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 811	Advanced Econometric Method I	2	1	0	3
STA 821	Bayesian Inference	2	1	0	3
STA 823	Operations Research	2	1	0	3
STA 825	Stochastic Processes	2	1	0	3

(iii) Computational Statistics and Operations Research

COURSE CODE	COURSE TITLE	L	T	P	U
STA 819	Functional Statistics	2	1	0	3
STA 823	Operations Research	2	1	0	3
STA 825	Stochastic Processes	2	1	0	3
STA 829	Statistical Data Mining	2	1	0	3

(iv) Spatial and Environmental Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 807	Categorical Data Analysis	2	1	0	3
STA 809	Survival Analysis	2	1	0	3
STA 821	Bayesian Inference	2	1	0	3
STA 827	Environmental Statistics	2	1	0	3

(v) Statistical Design and Investigation

COURSE CODE	COURSE TITLE	L	T	P	U
STA 813	Quality Control and Management I	2	1	0	3
STA 817	Advanced Sample Survey I	2	1	0	3
STA 825	Stochastic Processes	2	1	0	3
STA 833	Biometric Methods	2	1	0	3

Second Semester (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 802	Advanced Statistical Inference	2	1	0	3
STA 804	Statistical Games and Decision Theory	2	1	0	3
STA 806	Advanced Multivariate Analysis I	2	1	0	3
	At least six credit units of elective courses				6
Total					15

Second Semester (Elective courses): Students are to take at least 6 credit course units

(i) Biometry

COURSE CODE	COURSE TITLE	L	T	P	U
STA 808	Biostatistics	2	1	0	3
STA 816	Advanced Experimental Design II	2	1	0	3
STA 822	Spatial Statistics	2	1	0	3
STA 830	Statistical Pattern Recognition	2	1	0	3

(ii) Econometrics and Financial Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 812	Advanced Econometric Methods II	2	1	0	3
STA 824	Advanced Time Series Analysis	2	1	0	3
STA 826	Official Statistics	2	0	0	2
STA 828	Mathematics for Finance	2	1	0	3

(iii) Computational Statistics and Operations Research

COURSE CODE	COURSE TITLE	L	T	P	U
STA 820	Advanced Multivariate Analysis II	2	1	0	3
STA 824	Advanced Time Series Analysis	2	1	0	3
STA 826	Official Statistics	2	0	0	2
STA 830	Statistical Pattern Recognition	2	1	0	3

(iv) Spatial and Environmental Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 808	Biostatistics	2	1	0	3
STA 810	Advanced Demography	2	1	0	3
STA 816	Advanced Experimental Design II	2	1	0	3
STA 822	Spatial Statistics	2	1	0	3

(v) Statistical Design and Investigation

COURSE CODE	COURSE TITLE	L	T	P	U
STA 810	Advanced Demography	2	1	0	3
STA 814	Quality Control and Management II	2	1	0	3
STA 816	Advanced Experimental Design II	2	1	0	3
STA 818	Advanced Sample Survey II	2	1	0	3
STA 826	Official Statistics	2	0	0	2

Third Semester (Compulsory courses for all options)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 834	Students' Seminar	0	0	6	2
STA 899	Master's Dissertation	0	0	36	12

10. COURSE SYNOPSES

STA 801 Advanced Probability and Distribution Theory (3 units)

Limits theorems, various modes of convergence of sequence of variables and some probability functions and their limiting distributions. Generating function, characteristic function and inversion theorem. Univariate and Multivariate distribution and large sample theory; law of large number and central limit theorem for

independent and identically distributed and correlated random variables.

STA 802 Advanced Statistical Inference (3 units)
Theory of statistical inference, statistical models and their parameter estimation, methods of estimations, properties of estimator. Theory of hypothesis testing. Introduction to Bayesian inference. Large sample theory for confidence bounds, construction of tests: Best test, MP, UMP, UMPU, UMPI, and likelihood ratio criterion with their application.

STA 803Non-Parametric and Sequential Methods (3units)
Distribution of order statistics and quantities, One and two sample tests, Confidence Intervals, Transformations of statistics and their asymptotic properties. OC and ASN functions of the SPRT, SPRT for composite Hypotheses, Elements of sequential estimation, stein's two stage sampling method for point and interval estimation.

STA 804 Statistical Games and Decision Theory (3 units)
Elements of theory of Games; Rectangular game, Non-randomized and randomized strategies, Optimum strategies, Numerical and graphical methods for solution of games, Elements of Decision Theory, Relationship between Games Theory, Decision Theory and Statistical Inference, Non-randomized, randomized, Bayes and Min-max, Unbiased and invariants decision rules, Optimal decisions.

STA 805 Advanced Statistical Computing (3 units)
The design and use of existing statistical software such as E-View, S-PLUS, R, SPSS, STATA, SAS and STATISTICA to analyze real life data; identification of appropriate statistical tools and methods to be used. Generation of random numbers, methods of simulation of random processes. Statistical models and assumptions violation. Diagnosis Analysis, statistical consulting, report writing and presentation. Generation of random numbers, methods of simulation of random processes. Statistical models and assumptions violation. Monte-carlo experiments, Bootstrapping and Jackknife.

STA 806 Advanced Multivariate Analysis I (3 units)
Introductory ideas and basic concepts of matrix and their properties – transformations (including the Mahalanobis transformation), sample statistics and their properties, measures of dispersion in *d*-dimensional space, distances in *d*-dimensional space, simple graphical techniques. Multivariate normal distribution – Linear and quadratic forms. Partial and multiple correlation coefficients. Hypothesis testing of location in R^d and confidence intervals in one sample and two samples procedures –Hoteling T^2 test, Simultaneous and Benferroni confidence interval

STA 807 Categorical Data Analysis (3 units)
Probability Mass Function 2x2 tables measure of association for 2x2 tables and general r xc tables. Probability mass function for r x c tables. Goodness of fit tests. Square tables and their applications structural

STA 808 Biostatistics (3 units)
Direct and Indirect Assays; Fieller's theorem, Regression approaches to estimating dose-response relationships. Logit and probit. Approaches when dose-response curve for standard preparation is unknown; Quantal responses; Estimation of points on the quantal response function; estimation of extreme quantal, safe doses and dose allocation schemes; Polychotomous quantal response.

STA 809 Survival Analysis (3 units)
Introduction to survival analysis, descriptive method for survival data, censoring, Kaplan-Meier survival curves and the log-rank test. Parametric, semi-parametric, and non-parametric survival models. Cox-proportional hazard models and its characteristics. Recurrent event models. Frailty models

STA 810 Advanced Demography (3 units)
Introduction: Population without Age, Nature of demographic phenomena and data, life tables, Stationary population theories and extended models, stable population theories and its extensions, The matrix model framework, Projection and forecasting, Micro-demography, Family demography, Heterogeneity and selection in population analysis, Population growth models.

STA 811 Advanced Econometric Methods I (3 units)
Introduction to econometrics, Linear Regression Model and General Linear Hypothesis, Generalized and Weighted Least Squares Estimation, Restrictions and preliminary Test estimation, Multicollinearity, Heteroscedasticity and Autocorrelation. Dummy variable models.

STA 812 Advanced Econometric Methods II (3 units)
Specification Error Analysis, Tests for Structured change and Stability Modelling with Stochastic regressors, Stein-Rule Estimation, Instrumental variable Estimation, Measurement Error Models. Simultaneous

Equation Models, Seemingly Unrelated Regression Equation Models.

STA 813 Quality Control and Management I (3 units)
Analysis and control of variations in a production process. Operating characteristic of Control charts. Control chart for attributes and variables. Cumulative Sum control chart. Control charts based on weighted average. Methods of controlling several related characteristics. Process capability analysis. Economic and Design of Control charts. Specifications and Tolerances.

STA 814 Quality control and Management II (3 units)
Basic concept of sampling. Lot-by-lot Acceptance sampling for Attributes, Single, double, sequential, multiple sampling. Military standard 105D. Dodge-Romig sampling plans. Acceptance sampling by variable. Design of variable sampling plans with specified curve. One and double specification limits. Military standard 414, Continuous sampling, Chain sampling, Life testing and reliability. Evolutionary Operations.

STA 815 Advanced Experimental Design I (3 units)
Revision of Experimental Design Models and their Analysis, Incomplete Block Design: Intrablock analysis, adjusted treatment totals, reduced normal equation, 148 eighbor 148 l block design and connected design. Balanced Incomplete Block Design (BIBD), Resolvable Design, Efficiency balanced design. Missing observations in BIBD. Conditions for BIBD, Proper Design, Symmetric BIBD, Partially Balanced Incomplete Block Design (PBIBD): Association schemes (Rectangular, Triangular, Group Divisible, Latin square type, Cyclic type and Singly Linked Block). Response Surface Methodology.

STA 816 Advanced Experimental Design II (3 units)
Factorial Experiment: 2 factorial experiment, Yates method of Computation of Sum of Squares, Confounding; Partial confounding, Fractional Replications, Optimal Designs, Analysis of Covariance

STA 817 Advanced Sample Survey I (3 units)
Use of auxiliary information, Multivariate, Ratio, Regression and difference Estimator and their extension to double sampling procedure. Quenouilles technique of bias reduction. Sampling on successive occasions, non-sampling errors, and some specialized techniques.

STA 818 Advanced Sample Survey II (3 units)
Fundamental of Survey Inference, Fixed population approach, Super population approach. The stochastic structure, Super population Model. Basic concepts of survey sampling Unified theory of sampling. Sampling strategy. T-Class of linear estimators. Admissibility of II-T estimator. Estimators better than H-T estimator. Varying Probability selection: Midzuno-Sen, Rao-Hartley-Cochran and other schemes. Ordered and Unordered estimators.

STA 819 Functional Statistics (3 units)
Introduction to the analysis of data that may be considered to besmooth functions. Visualization and data exploration, nonparametric smoothing, functional Data, Representing functions by basic functions, the Fourier basis system for period data, spline basis system for open-ended data, other useful basis functions, fitting data using a basis system by least squares, ordinary or unweighted least squares fits, weighted least squares fits, registration and display of functional data, non-linear smoothing, regularized principal components analysis, functional principle components analysis, functional linear model with functional response and a categorical independent variable, functional canonical correlation analysis.

STA 820 Advanced Multivariate Analysis II (3 units)
Review of basic concept. Multivariate quality control. Principal component analysis (PCA), Interpretation using illustrative examples. Factor analysis: Comparison with PCA, factor loadings, rotations, Interpretation. Two-group discriminant analysis. Multiple-group discriminant analysis. Cluster Analysis. Multidimensional scaling. Correspondence analysis

STA 821 Bayesian Inference (3 units)
Empirical Bayes, some aspects of multivariate problems, sequential nature of Bayesian inference, prior and posterior distribution of parameters in binomial, Poisson, exponential and normal populations, comparison of two normal distribution distributions, predictive distributions, decision theory, utility, risk aversion, extensive form of analysis, two-action problems, point estimation, best population problem, economics of sampling.

STA 822 Spatial Statistics (3 units)
Exploratory spatial data analysis using both graphical and quantitative descriptions of spatial data including the empirical variogram. Theoretical isotropic and anisotropic variogram models and various methods for fitting variogram models such as maximum likelihood, restricted maximum likelihood, and weighted least squares. Techniques for prediction of spatial processes such as simple, ordinary, universal, and Bayesian kriging.

Spatial sampling procedures, lattice data, and spatial point processes

STA 823 Operations Research (3 units)
Deterministic and Probabilistic models. Linear programming methods, non-linear integer and dynamic programming with applications, inventory and stock control. Applications of stochastic processes e.g. queuing theory or simulation techniques, games theory and network analysis, transportation problem, Markov chain. Application of decision analysis in dynamic programming, competitive and search problems. Markovian process and probabilistic dynamic programming

STA 824 Advanced Time Series Analysis (3 units)
Theory of stochastic models and their forecasting. Model building: identification, estimation. Diagnostic checking. Analysis of stationary Data Co-integration and error correction techniques General stationary, non-stationary models, auto covariance functions stationary, non-stationary autoregressive integrated moving average models. Frequency based techniques of time series analysis, Spectral theory statistical, Unit root and Co-integration, Kilmer filter.

STA 825 Stochastic Processes (3 units)
Classification of stochastic processes, Random walk models, Discrete queuing chain, Inventory model, Branching processes, Poisson, Birth, and Death processes, waiting time models, Gaussian processes [Martingales], Mean, covariance and sample functions, Integration and differentiation of SPs, Estimation problems.

STA 826 Official Statistics (2 units)
Introduction to Nigeria and International Statistical Systems. Role and activities of Central and State Statistical organizations. Organisation of large scale sample surveys. Role of National Sample Survey Organization. General and special data dissemination. Population growth, projection of labour force and manpower. Nigerian population census. Statistics related to industries, foreign trade, balance of payment, cost of living, inflation, educational and social statistics

STA 827 Environmental Statistics (3 units)
Diffusion, dilution and dispersion of pollutants. Stochastic Random Dilution, Statistical tools in environmental impact assessment. Statistical Methods in Public Health, Ecological diversity: species abundance curve, indices of diversity. Air soil and water pollution, Statistical Modelling in Climate Change and Forecasting.

STA 828 Mathematics of Finance (3 units)
Probability Models, Life Tables, Multiple Life functions, Multiple decrement models, Utility theory. Distribution of aggregate claims, simple and compound interest, Poisson distribution and its applications. Insurance and Annuities

STA 829 Statistical Data Mining (3 units)
Review of classification methods from multivariate analysis, classification and decision trees. Concepts of Data Mining: visualization and exploration, algorithms and score functions, models and patterns, search and optimization; Predictive modelling in data mining. Statistical/machine learning with methods: linear; non-linear; classification; Markov models; Nearest neighbours. Bayesian Networks. Concepts of Statistical Neural Network with applications; Introduction to Fuzzy Logic. Overview of Statistical Robotics. Introduction to databases, data warehouses and online analytical data processing.

STA 830 Statistical Pattern Recognition (3 units)
Introduction to statistical pattern recognition; Pattern recognition systems; Classifiers: optimal and bayes; Discriminant functions: linear and non-linear; Probability of errors and its estimation; Chernoff and Bhattacharya distances; Interclass and probabilistic distance measures. Clustering and Kernels; Mixture models and models combination; Approximate inference and performance assessment; Sampling methods; Latent variables; Sequential Data; Feature selection and extraction; Measures of dissimilarity; Complex networks.

STA 831 Statistical Ecology (3 units)
Introduction to ecology and evolution. Population dynamics (single species and two species). Abundance estimation: Capture-recapture, Nearest Neighbor, line transect sampling, indirect method. Harvesting renewable biological resources. Game theory in ecology. Foraging theory: Optimal foraging, diet choice, mean variance trade-off

STA 833 Biometric Methods (3 units)
Biological assay: Direct assays, Fieller's theorem, dilution assays. Dose-response relationships. Parallel line and stop ration assays. Assays based on quantal responses. Quantitative genetics: Mendellian principles. Hardy-Weinberg law.Inheritance of binary characters.Inheritance of continuous traits.Sexlinkages.Covariation between relatives. Genotopic and environmental variance. Heritability: inheritance of human disease, intelligence. Plant and animal breeding.Covariance Structure: modified split plot

analysis; MANOVA and ante-dependence analysis; model for categorical repeated measurements; random coefficient regression models

STA 834 Seminar (2 units)
Students shall be required to present at least one seminar in an area of specialization in Statistics

STA 899 Master's Dissertation (12 units)
Students will carry out a research project under the supervision of an academic staff. The research of which outcome should contribute to knowledge and directed at solving a real life problem. The student will be expected to make an oral presentation (proposal and final) in departmental seminars. He/she shall be required to submit a typed and bound final report of the dissertation upon the completion of the research and will be expected to satisfy a panel of examiners at an oral examination

CURRICULUM FOR MASTER OF PHILOSOPHY [M. Phil] PROGRAMMES IN STATISTICS

1. PROGRAMME OFFERED:
Master of Philosophy (M.Phil.)

2. AVAILABLE OPTIONS/SPECIALIZATIONS

i) Biometry
ii) Econometrics and Financial Statistics
iii) Computational Statistics and Operation Research
iv) Spatial and Environmental Statistics
v) Statistical Design and Investigations

3. PROGRAMME PHILOSOPHY

The programme is designed to equip prospective candidates with adequate knowledge and more exposure to master-level course work and seminars. It is intended to foster the development of independent research skills to enhance their ability to proceed to Ph.D degree programme in Statistics which are areas of intense research and application activities worldwide with focus on advanced theoretical and practical training to ensure the attainment of desired intellectual development and competence in solving real life problems. The programme is by course work and research activities in Statistics. Research for this degree will be independently carried out under the guidance of members of staff of the Department.

4. PROGRAMME OBJECTIVES

The objectives of the programme are to:

i) develop and give advanced academic and professional training (practical and theoretical) in all areas of Statistics for the purpose of job placement in the industries and higher institutions of learning;

ii) expose the students to current research and up-to-date methodologies in Statistics, and increase their understanding of the applications of research methodology to solve real-life problems in areas of agriculture, commerce, industry, medicine and other disciplines that require the knowledge of Statistics; and

iii) develop manpower that is research-oriented in the area of Statistics for the sustenance of teaching and research in both public and private institutions of higher learning and non-governmental organizations.

5. PROGRAMME JUSTIFICATION

The field of statistics has continued to witness increasing expansion as new areas and new techniques are developed. Hence, courses have to be in tune with the latest developments in the subject and also take cognizance of the newer methods of statistical analysis which are now totally computerized. In addition, demand for products of the programme has risen in recent times because of the increase in the number of private and public tertiary institutions offering Statistics in the Country. Therefore, the programme is intended to foster the development of student's research skills and enhance their ability to proceed to the Doctor of Philosophy (Ph. D) degree programme.

6. ADMISSION REQUIREMENTS

Candidates seeking admission to M. Phil must possess academic Master`s degree in Statistics from FUTA or any other recognized University and must have scored between 50% and 54.9% or 2.4 - 2.99 on a 5.0 point grade.

7. PROGRAMME DURATION

The Master of Philosophy Programme in Statistics shall be a Full-Time programme of twelve (12) to eighteen (18) months duration.

8. GRADUATION REQUIREMENTS

To qualify for the award of M. Phil degree in Statistics, a candidate must have:

i) passed all courses recommended by the Department with a minimum score of 50% in each course;
ii) successfully presented at least two departmental seminars (proposal and progress seminars);
iii) successfully completed the Thesis Titles Registration Application (TTRA) according to the School of Postgraduate Studies regulations; and
iv) fulfilled other conditions as prescribed by the School of Postgraduate Studies of the University.

9. COURSE OUTLINE

FIRST SEMESTER (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 841	Advanced Mathematical Statistics I	2	1	0	3
	At least six credit units of elective courses				6
Total					9

FIRST SEMESTER (Electives courses):
(vi) Biometry

COURSE CODE	COURSE TITLE	L	T	P	U
STA 845	Advanced Survival Analysis	2	1	0	3
STA 851	Advanced Experimental Design	2	1	0	3
STA 859	Advanced Environmental Statistics	2	1	0	3
STA 860	Advanced Statistical Data Mining	2	1	0	3

(vii) Econometrics and Financial Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 847	Advanced Econometric Method	2	1	0	3
STA 855	Advanced Bayesian Inference	2	1	0	3
STA 857	Advanced Stochastic Processes	2	1	0	3
STA 860	Advanced Statistical Data Mining	2	1	0	3

(viii) Computational Statistics and Operations Research

COURSE CODE	COURSE TITLE	L	T	P	U
STA 849	Advanced Quality Control and Management	2	1	0	3
STA 853	Advanced Sampling Theory	2	1	0	3
STA 857	Advanced Stochastic Processes	2	1	0	3
STA 860	Advanced Statistical Data Mining	2	1	0	3

(ix) Spatial and Environmental Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 843	Categorical Data Analysis	2	1	0	3
STA 845	Advanced Survival Analysis	2	1	0	3
STA 855	Advanced Bayesian Inference	2	1	0	3
STA 859	Advanced Environmental Statistics	2	1	0	3

(x) Statistical Design and Investigation

COURSE CODE	COURSE TITLE	L	T	P	U
STA 849	Advanced Quality Control and Management	2	1	0	3
STA 851	Advanced Experimental Design	2	1	0	3
STA 853	Advanced Sampling Theory	2	1	0	3
STA 857	Advanced Stochastic Processes	2	1	0	3

SECOND SEMESTER (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 842	Advanced Mathematical Statistics II	2	1	0	3
	At least three credit units of elective courses				3
Total					6

SECOND SEMESTER (Electives courses):

(i) Biometry

COURSE CODE	COURSE TITLE	L	T	P	U
STA 846	Biostatistics	2	1	0	3
STA 850	Advanced Statistical Pattern Recognition	2	1	0	3
STA 858	Advanced Statistical Ecology	2	1	0	3

(ii) Econometrics and Financial Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 848	Advanced Time Series Analysis	2	1	0	3
STA 852	Advanced Official Statistics	2	1	0	3
STA 856	Advanced Operations Research	2	1	0	3

(iii) Computational Statistics and Operations Research

COURSE CODE	COURSE TITLE	L	T	P	U
STA 848	Advanced Time Series Analysis	2	1	0	3
STA 850	Advanced Statistical Pattern Recognition	2	1	0	3
STA 854	Advanced Multivariate Analysis	2	1	0	3
STA 856	Advanced Operations Research	2	1	0	3

(iv) Spatial and Environmental Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 844	Advanced Spatial Statistics	2	1	0	3
STA 846	Biostatistics	2	1	0	3
STA 850	Advanced Statistical Pattern Recognition	2	1	0	3
STA 858	Advanced Statistical Ecology	2	1	0	3

(v) Statistical Design and Investigation

COURSE CODE	COURSE TITLE	L	T	P	U
STA 848	Advanced Time Series Analysis	2	1	0	3
STA 852	Advanced Official Statistics	2	1	0	3
STA 854	Advanced Multivariate Analysis	2	1	0	3
STA 856	Advanced Operations Research	2	1	0	3

THIRD SEMESTER (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 895	M. Phil. Thesis Research	0	0	36	12
Total					12

10. COURSE SYNOPSES

STA 841 Advanced Mathematical Statistics I (3 Units)
Limits theorems, various modes of convergence of sequence of variables and some probability functions and their limiting distributions. Generating functions-moments, probability, cumulant. Characteristic function and inversion theorem. Univariate and multivariate distributions and large sample theory; law of large number and central limit theorem for independent and identically distributed and correlated random variables

STA 842 Advanced Mathematical Statistics II (3 Units)
Theory of statistical inference, statistical models and their parameter estimation, methods of estimations properties of estimator. Minimum variance unbiased estimation, the Cramer-Rao lower bound, exponential families, sufficient statistics, the Rao-Blackwell theorem, efficiency, consistency. Large sample theory for confidence bounds. Theory of hypothesis testing and introduction to Bayesian inference, construction of tests: Best test, MP, UMP, UMPU, UMPI, the Neyman-Pearson lemma and likelihood ratio criterion with their application.

STA 843 Categorical Data Analysis (3 Units)
Probability Mass Function 2x2 tables measure of association for 2x2 tables and general cxc tables. Probability mass function for rxc tables. Goodness of fit tests. Square tables and their applications structural

STA 844 Advanced Spatial Statistics (3 Units)
Exploratory spatial data analysis using both graphical and quantitative descriptions of spatial data including the empirical variogram. Theoretical isotropic and anisotropic variogram models and various methods for fitting variogram models such as maximum likelihood, restricted maximum likelihood, and weighted least squares. Techniques for prediction of spatial processes such as simple, ordinary, universal, and Bayesian kriging.

Spatial sampling procedures, lattice data, and spatial point processes

STA 845 Advanced Survival Analysis (3 Units)

Introduction to survival analysis, descriptive method for survival data, censoring, Kaplan-meier survival curves and the log-rank test, Parametric, semi-parametric, and non-parametric survival models, Cox-proportional hazard models and its characteristics, Recurrent event models, Frailty models

STA 846 Biostatistics (3 Units)

Direct and Indirect Assays; Fieller's Theorem, Regression Approaches to Estimating Dose-response Relationships. Logit and Probit Approaches when Dose-response Curve for Standard Preparation is unknown; Quantal responses; Estimation of points on the quantal Response function; Estimation of extreme quantal, safe doses and dose allocation schemes; Polychotomous quantal response

STA 847 Advanced Econometric Methods

Introduction of basic concept, Specification Error Analysis, Tests for Structured change and Stability Modelling with Stochastic regressors, Stein-Rule Estimation, Instrumental variable Estimation, Measurement Error Models. Simultaneous Equation Models, Seemingly Unrelated Regression Equation Models.

STA 848 Advanced Time Series Analysis (3 Units)

Theory of stochastic models and their forecasting. Model building: identification, estimation. Diagnostic checking. Analysis of stationary Data Co-integration and error correction techniques General stationary, non-stationary models, auto covariance functions stationary, non-stationary autoregressive integrated moving average models. Frequency based techniques of time series analysis, Spectral theory statistical, Unit root and Co integration, Kilmer filter

STA 849 Advanced Quality control and Management (3 Units)

Sampling inspection, Lot-by-lot Acceptance sampling for Attributes, Single, double, sequential, multiple sampling, Military standard 105D, Dodge-Romig sampling plans, Acceptance sampling by variable, Design of variable sampling plans with specified curve, One and double specification limits, Military standard 414, Continuous sampling, Chain sampling, Life testing and reliability.

STA 850 Advanced Statistical Pattern Recognition (3 Units)

Introduction to statistical pattern recognition; Pattern recognition systems; Classifiers: optimal and bayes; Discriminant functions: linear and non-linear; Probability of errors and its estimation; Chernoff and Bhattacharya distances; Interclass and probabilistic distance measures. Clustering and Kernels; Mixture models and models combination; Approximate inference and performance assessment; Sampling methods; Latent variables; Sequential Data; Feature selection and extraction; Measures of dissimilarity; Complex networks.

STA 851 Advanced Experimental Design (3 Units)

Introduction of basic concept, Factorial Experiment:2n factorial experiment, Yates method of Computation of Sum of Squares, Confounding; Partial confounding, Fractional Replications, Optimal Designs, Analysis of Covariance

STA 852 Advanced Official Statistics (3 Units)

Nigeria and International Statistical Systems. Role and activities of Central and State Statistical organizations. Organisation of large-scale sample surveys. Role of National Sample Survey Organization. General and special data dissemination. Population growth, projection of labour force and manpower. Nigerian population census. Statistics related to industries, foreign trade, balance of payment, cost of living, inflation, educational and social statistics

STA 853 Advanced Sampling Theory (3 Units)

Fundamental of Survey Inference, Fixed population approach, Super population approach, The stochastic structure, Super population Model.Basic concepts of survey sampling Unified theory of sampling. Sampling strategy. T-Class of linear estimators. Admissibility of II-T estimator. Estimators better than H-T estimator. Varying Probability selection: Midzuno-Sen, Rao-Hartley-Cochran and other schemes. Ordered and Unordered estimators.

STA 854 Advanced Multivariate Analysis (3 Units)

Review of basic concept. Multivariate quality control. Principal component analysis (PCA), Interpretation using illustrative examples. Factor analysis: Comparison with PCA, factor loadings, rotations, Interpretation. Two-groups discriminant analysis. Multiple-group discriminant analysis. Cluster Analysis. Multidimensional scaling. Correspondence analysis

STA 855 Advanced Bayesian Inference (3 Units)
Empirical Bayes, some aspects of multivariate problems, sequential nature of Bayesian inference, prior and posterior distribution of parameters in binomial, Poisson, exponential and normal populations, comparison of two normal distribution distributions, predictive distributions, decision theory, utility, risk aversion, extensive form of analysis, two-action problems, point estimation, best population problem, economics of sampling.

STA 856 Advanced Operations Research (3 Units)
Deterministic and Probabilistic models. Linear programming methods, non-linear integer and dynamic programming with applications, inventory and stock control. Applications of stochastic processes e.g. queuing theory or simulation techniques, games theory and network analysis, transportation problem, Markov chain. Application of decision analysis in dynamic programming, competitive and search problems. Markovian process and probabilistic dynamic programming

STA 857 Advanced Stochastic Process (3 Units)
Classification of stochastic processes, Random walk models, Discrete queuing chain, Inventory model, Branching processes, Poisson, Birth, and Death processes, waiting time models, Gaussian processes [Martingales], Mean, covariance and sample functions, Integration and differentiation of SPs, Estimation problems

STA 858 Advanced Statistical Ecology (3 Units)
Introduction to ecology and evolution. Population dynamics (single species and two species). Abundance estimation: Capture-recapture, Nearest neighbour, line transect sampling, indirect method. Harvesting renewable biological resources. Game theory in ecology. Foraging theory: Optimal foraging, diet choice, mean variance trade-off

STA 859 Advanced Environmental Statistics (3 Units)
Diffusion, dilution and dispersion of pollutants. Stochastic Random Dilution, Statistical tools in environmental impact assessment. Statistical Methods in Public Health, Ecological diversity: species abundance curve, indices of diversity. Air soil and water pollution, Statistical Modelling in Climate Change and Forecasting

STA 860 Advanced Statistical Data Mining (3 Units)
Review of classification methods from multivariate analysis, classification and decision trees. Concepts of Data Mining: visualization and exploration, algorithms and score functions, models and patterns, search and optimization; Predictive modelling in data mining. Statistical/machine learning with methods: linear; non-linear; classification; Markov models; Nearest neighbours. Bayesian Networks. Concepts of Statistical Neural Network with applications; Introduction to Fuzzy Logic. Overview of Statistical Robotics. Introduction to databases, data warehouses and online analytical data processing.

STA 895 M. Phil Thesis Research (12 Units)
Students will carry out a research project under the supervision of an academic staff. The research of which outcome should contribute to knowledge and directed at solving a real-life problem. The student will be expected to make an oral presentation in departmental seminars. A final report of the dissertation will be typed and bound in an approved format and the student will be expected to satisfy a panel of examiners at an oral examination.

CURRICULUM FOR MASTER OF PHILOSOPHY/ DOCTOR OF PHILOSOPHY [M. Phil / Ph. D] PROGRAMMES IN STATISTICS

1. **PROGRAMME OFFERED:** Master of Philosophy / Doctor of Philosophy (M. Phil / Ph. D)

2. **AVAILABLE OPTIONS/SPECIALIZATIONS**
   i) Biometry
   ii) Econometrics and Financial Statistics
   iii) Computational Statistics and Operation Research
   iv) Spatial and Environmental Statistics
   v) Statistical Design and Investigations

3. **PROGRAMME PHILOSOPHY**
The programme is designed to meet the research needs of the candidates with the M. Tech/ M. Sc. Degree in Statistics. It is intended to foster the development of independent research skills to enhance their ability to proceed to Ph.D degree programme. The programme is also designed to equip prospective candidates with adequate knowledge and research skills in Statistics which are areas of intense research and application activities worldwide with focus on advanced theoretical and practical training to ensure the attainment of desired

intellectual development and competence in solving real life problems. The programme is by course work and research activities in Statistics. Research for this degree will be independently carried out under the guidance of members of staff of the Department.

4. PROGRAMME OBJECTIVES

The objectives of the programme are to:

i) develop and give advanced academic and professional training (practical and theoretical) in all areas of Statistics for the purpose of job placement in the industries and higher institutions of learning;
ii) expose the students to current research and up-to-date methodologies in Statistics, and increase their understanding of the applications of research methodology to solve real-life problems in areas of agriculture, commerce, industry, medicine and other disciplines that require the knowledge of Statistics; and
iii) develop manpower that is research-oriented in the area of Statistics for the sustenance of teaching and research in both public and private institutions of higher learning and non-governmental organizations.

5. PROGRAMME JUSTIFICATION

The field of statistics has continued to witness increasing expansion as new areas and new techniques are developed. Hence, courses have to be in tune with the latest developments in the subject and also take cognizance of the newer methods of statistical analysis which are now totally computerized. In addition, demand for products of the programme has risen in recent times because of the increase in the number of private and public tertiary institutions offering Statistics in the country. Therefore, the programme is intended to foster the development of student's research skills and enhance their ability to proceed to the Doctor of Philosophy (Ph. D) degree programme.

6. ADMISSION REQUIREMENTS

Candidates seeking admission to M. Phil / Ph. D must possess academic Master`s degree in Statistics from FUTA or any other recognized University and must have scored between 55% and 59.9% or 3.0 - 3.49 on a 5.0 point grade.

7. PROGRAMME DURATION

i) The M. Phil/Ph. D programme in Statistics shall be a Full-Time Programme of twelve (12) to eighteen (18) months duration and candidates who fail to meet the minimum requirements for conversion to Ph. D shall terminate the programme at the M. Phil level.
ii) The final oral examination shall follow the same procedure as for the M. Phil. Oral examination.

8. CONVERSION/ GRADUATION REQUIREMENTS

Candidate is expected to satisfy the following conditions:

i) passed all course work as prescribed by the Department in his/her area of specialization;
ii) the candidate must score an average of 60% or 3.50 and above on a 5-point grading system;
iii) if the student cannot proceed to Ph.D, the student will be awarded the terminal degree of M. Phil provided the candidate fulfilled the following conditions:
   a. passed all the courses recommended by the Department with a minimum score of 50% in each course;
   b. successfully presented at least 2 seminars (proposal and progress seminars);
   c. successfully completed the thesis title registration according to the regulations of the School of Postgraduate Studies
   d. successfully defended the research thesis before a panel of examiners; and
   e. fulfilled other conditions as prescribed by the School of Postgraduate Studies.

9. REQUIREMENTS FOR CONVERSION FROM M. PHIL / PH.D. TO PH.D:

A candidate who enters M. Phil/ Ph. D. programme may convert to Ph. D. programme if he/she fulfils the following requirements:

i) successfully presented at least two (2) departmental seminars: proposal and progress seminars;
ii) completed and passed all course work in each semester along with the graded seminar presentation with a CGPA of not less than 3.5 in the M. Phil/Ph.D programme;
iii) presented a detailed report of research work done up to the time of seeking conversion and submitted to the School of Postgraduate Studies or any relevant published and unpublished materials that can be assessed by the Department.
(iv) presented a written thesis and defended such at an oral examination before a panel of

examiners organized by the School of Postgraduate Studies
(v) fulfilled all other conditions as approved by the University Senate
(vi) obtain and complete Ph.D conversion form as appropriate.

10. COURSE OUTLINE

FIRST SEMESTER (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 841	Advanced Mathematical Statistics I	2	1	0	3
	At least three credit units of elective courses				3
Total					6

FIRST SEMESTER (Electives courses):
(xi) Biometry

COURSE CODE	COURSE TITLE	L	T	P	U
STA 845	Advanced Survival Analysis	2	1	0	3
STA 851	Advanced Experimental Design	2	1	0	3
STA 859	Advanced Environmental Statistics	2	1	0	3
STA 860	Advanced Statistical Data Mining	2	1	0	3

(xii) Econometrics and Financial Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 847	Advanced Econometric Method	2	1	0	3
STA 855	Advanced Bayesian Inference	2	1	0	3
STA 857	Advanced Stochastic Processes	2	1	0	3
STA 860	Advanced Statistical Data Mining	2	1	0	3

(xiii) Computational Statistics and Operations Research

COURSE CODE	COURSE TITLE	L	T	P	U
STA 849	Advanced Quality Control and Management	2	1	0	3
STA 853	Advanced Sampling Theory	2	1	0	3
STA 857	Advanced Stochastic Processes	2	1	0	3
STA 860	Advanced Statistical Data Mining	2	1	0	3

(xiv) Spatial and Environmental Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 843	Categorical Data Analysis	2	1	0	3
STA 845	Advanced Survival Analysis	2	1	0	3
STA 855	Advanced Bayesian Inference	2	1	0	3
STA 859	Advanced Environmental Statistics	2	1	0	3

(xv) Statistical Design and Investigation

COURSE CODE	COURSE TITLE	L	T	P	U
STA 849	Advanced Quality Control and Management	2	1	0	3
STA 851	Advanced Experimental Design	2	1	0	3
STA 853	Advanced Sampling Theory	2	1	0	3
STA 857	Advanced Stochastic Processes	2	1	0	3

SECOND SEMESTER (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 842	Advanced Mathematical Statistics II	2	1	0	3
	At least three credit units of elective courses				3
Total					6

SECOND SEMESTER (Electives courses):

(vi) Biometry

COURSE CODE	COURSE TITLE	L	T	P	U
STA 846	Biostatistics	2	1	0	3
STA 850	Advanced Statistical Pattern Recognition	2	1	0	3
STA 858	Advanced Statistical Ecology	2	1	0	3

(vii) Econometrics and Financial Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 848	Advanced Time Series Analysis	2	1	0	3
STA 852	Advanced Official Statistics	2	1	0	3
STA 856	Advanced Operations Research	2	1	0	3

(viii) Computational Statistics and Operations Research

COURSE CODE	COURSE TITLE	L	T	P	U
STA 848	Advanced Time Series Analysis	2	1	0	3
STA 850	Advanced Statistical Pattern Recognition	2	1	0	3
STA 854	Advanced Multivariate Analysis	2	1	0	3
STA 856	Advanced Operations Research	2	1	0	3

(ix) Spatial and Environmental Statistics

COURSE CODE	COURSE TITLE	L	T	P	U
STA 844	Advanced Spatial Statistics	2	1	0	3
STA 846	Biostatistics	2	1	0	3
STA 850	Advanced Statistical Pattern Recognition	2	1	0	3
STA 858	Advanced Statistical Ecology	2	1	0	3

(x) Statistical Design and Investigation

COURSE CODE	COURSE TITLE	L	T	P	U
STA 848	Advanced Time Series Analysis	2	1	0	3
STA 852	Advanced Official Statistics	2	1	0	3
STA 854	Advanced Multivariate Analysis	2	1	0	3
STA 856	Advanced Operations Research	2	1	0	3

THIRD SEMESTER (Compulsory courses)

COURSE CODE	COURSE TITLE	L	T	P	U
STA 897	M. Phil. / Ph. D Thesis Research	0	0	36	12
Total					12

11. COURSE SYNOPSES

STA 841 Advanced Mathematical Statistics I (3 Units)
Limits theorems, various modes of convergence of sequence of variables and some probability functions and their limiting distributions. Generating functions-moments, probability, cumulant. Characteristic function and inversion theorem. Univariate and multivariate distributions and large sample theory; law of large number and central limit theorem for independent and identically distributed and correlated random variables

STA 842 Advanced Mathematical Statistics II (3 Units)
Theory of statistical inference, statistical models and their parameter estimation, methods of estimations properties of estimator. Minimum variance unbiased estimation, the Cramer-Rao lower bound, exponential families, sufficient statistics, the Rao-Blackwell theorem, efficiency, consistency. Large sample theory for confidence bounds. Theory of hypothesis testing and introduction to Bayesian inference, construction of tests: Best test, MP, UMP, UMPU, UMPI, the Neyman-Pearson lemma and likelihood ratio criterion with their application.

STA 843 Categorical Data Analysis (3 Units)
Probability Mass Function 2x2 tables measure of association for 2x2 tables and general cxc tables. Probability mass function for rxc tables. Goodness of fit tests. Square tables and their applications structural

STA 844 Advanced Spatial Statistics (3 Units)
Exploratory spatial data analysis using both graphical and quantitative descriptions of spatial data including the empirical variogram. Theoretical isotropic and anisotropic variogram models and various methods for fitting variogram models such as maximum likelihood, restricted maximum likelihood, and weighted least squares. Techniques for prediction of spatial processes such as simple, ordinary, universal, and Bayesian kriging. Spatial sampling procedures, lattice data, and spatial point processes

STA 845 Advanced Survival Analysis (3 Units)
Introduction to survival analysis, descriptive method for survival data, censoring, Kaplan-meier survival curves and the log-rank test, Parametric, semi-parametric, and non-parametric survival models, Cox-proportional hazard models and its characteristics, Recurrent event models, Frailty models

STA 846 Biostatistics (3 Units)
Direct and Indirect Assays; Fieller's Theorem, Regression Approaches to Estimating Dose-response Relationships. Logit and Probit Approaches when Dose-response Curve for Standard Preparation is unknown; Quantal responses; Estimation of points on the quantal Response function; Estimation of extreme quantal, safe doses and dose allocation schemes; Polychotomous quantal response

STA 847 Advanced Econometric Methods
Introduction of basic concept, Specification Error Analysis, Tests for Structured change and Stability Modelling with Stochastic regressors, Stein-Rule Estimation, Instrumental variable Estimation, Measurement Error Models. Simultaneous Equation Models, Seemingly Unrelated Regression Equation Models.

STA 848 Advanced Time Series Analysis (3 Units)
Theory of stochastic models and their forecasting. Model building: identification, estimation. Diagnostic checking. Analysis of stationary Data Co-integration and error correction techniques General stationary, non-stationary models, auto covariance functions stationary, non-stationary autoregressive integrated moving average models. Frequency based techniques of time series analysis, Spectral theory statistical, Unit root and Co integration, Kilmer filter

STA 849 Advanced Quality control and Management (3 Units)
Sampling inspection, Lot-by-lot Acceptance sampling for Attributes, Single, double, sequential, multiple sampling, Military standard 105D, Dodge-Romig sampling plans, Acceptance sampling by variable, Design of variable sampling plans with specified curve, One and double specification limits, Military standard 414, Continuous sampling, Chain sampling, Life testing and reliability.

STA 850 Advanced Statistical Pattern Recognition (3 Units)
Introduction to statistical pattern recognition; Pattern recognition systems; Classifiers: optimal and bayes; Discriminant functions: linear and non-linear; Probability of errors and its estimation; Chernoff and Bhattacharya distances; Interclass and probabilistic distance measures. Clustering and Kernels; Mixture models and models combination; Approximate inference and performance assessment; Sampling methods; Latent variables; Sequential Data; Feature selection and extraction; Measures of dissimilarity; Complex networks.

STA 851 Advanced Experimental Design (3 Units)
Introduction of basic concept, Factorial Experiment:2n factorial experiment, Yates method of Computation of Sum of Squares, Confounding; Partial confounding, Fractional Replications, Optimal Designs, Analysis of Covariance

STA 852 Advanced Official Statistics (3 Units)
Nigeria and International Statistical Systems. Role and activities of Central and State Statistical organizations. Organisation of large-scale sample surveys. Role of National Sample Survey Organization. General and special data dissemination. Population growth, projection of labour force and manpower. Nigerian population census. Statistics related to industries, foreign trade, balance of payment, cost of living, inflation, educational and social statistics

STA 853 Advanced Sampling Theory (3 Units)
Fundamental of Survey Inference, Fixed population approach, Super population approach, The stochastic structure, Super population Model.Basic concepts of survey sampling Unified theory of sampling. Sampling strategy. T-Class of linear estimators. Admissibility of II-T estimator. Estimators better than H-T estimator. Varying Probability selection: Midzuno-Sen, Rao-Hartley-Cochran and other schemes. Ordered and Unordered estimators.

STA 854 Advanced Multivariate Analysis (3 Units)
Review of basic concept. Multivariate quality control. Principal component analysis (PCA), Interpretation using illustrative examples. Factor analysis: Comparison with PCA, factor loadings, rotations, Interpretation. Two-groups discriminant analysis. Multiple-group discriminant analysis. Cluster Analysis. Multidimensional scaling. Correspondence analysis

STA 855 Advanced Bayesian Inference (3 Units)
Empirical Bayes, some aspects of multivariate problems, sequential nature of Bayesian inference, prior and posterior distribution of parameters in binomial, Poisson, exponential and normal populations, comparison of two normal distribution distributions, predictive distributions, decision theory, utility, risk aversion, extensive form of analysis, two-action problems, point estimation, best population problem, economics of sampling.

STA 856 Advanced Operations Research (3 Units)
Deterministic and Probabilistic models. Linear programming methods, non-linear integer and dynamic programming with applications, inventory and stock control. Applications of stochastic processes e.g.

queuing theory or simulation techniques, games theory and network analysis, transportation problem, Markov chain. Application of decision analysis in dynamic programming, competitive and search problems. Markovian process and probabilistic dynamic programming

STA 857 Advanced Stochastic Process (3 Units)
Classification of stochastic processes, Random walk models, Discrete queuing chain, Inventory model, Branching processes, Poisson, Birth, and Death processes, waiting time models, Gaussian processes [Martingales], Mean, covariance and sample functions, Integration and differentiation of SPs, Estimation problems

STA 858 Advanced Statistical Ecology 3 Units)
Introduction to ecology and evolution. Population dynamics (single species and two species). Abundance estimation: Capture-recapture, Nearest neighbour, line transect sampling, indirect method. Harvesting renewable biological resources. Game theory in ecology. Foraging theory: Optimal foraging, diet choice, mean variance trade-off

STA 859 Advanced Environmental Statistics (3 Units)
Diffusion, dilution and dispersion of pollutants. Stochastic Random Dilution, Statistical tools in environmental impact assessment. Statistical Methods in Public Health, Ecological diversity: species abundance curve, indices of diversity. Air soil and water pollution, Statistical Modelling in Climate Change and Forecasting

STA 860 Advanced Statistical Data Mining (3 Units)
Review of classification methods from multivariate analysis, classification and decision trees. Concepts of Data Mining: visualization and exploration, algorithms and score functions, models and patterns, search and optimization; Predictive modelling in data mining. Statistical/machine learning with methods: linear; non-linear; classification; Markov models; Nearest neighbours. Bayesian Networks. Concepts of Statistical Neural Network with applications; Introduction to Fuzzy Logic. Overview of Statistical Robotics. Introduction to databases, data warehouses and online analytical data processing.

STA 897 M. Phil / Ph. D Thesis Research (12 Units)
Students will carry out a research project under the supervision of one or more members of academic staff. The student will be responsible for the design, analyses and conduct of the study which represents his/her individual research, of which outcome should contribute to knowledge and directed at solving a real-life problem. The student will be expected to prepare thesis, which represents the report of the study, in an organized and well written form. The student is expected to present at least two seminars before the final oral presentation. The student will be expected to defend a final report of the dissertation before a panel of examiners at an oral examination.

10. LIST OF ACADEMIC STAFF

S/N	NAME	QUALIFICATIONS	STATUS	AREA OF SPECIALIZATION
1	Prof. O. A. Adeoti	B. Sc. (Ilorin), M.Sc. (Lagos), Ph. D (Ilorin)	Professor	Process Control/ Quality Control and Management/ Probability Distributions /Artificial Neural Network
2	Prof. O. A. Fasoranbaku	B.Sc. (Ilorin), M.Sc., Ph. D (Ibadan)	Professor	Econometrics/Time Series/Experimental Design
3	Prof. F. B. Adebola	B.Sc., M.Sc., Ph. D (Ilorin),	Professor	Sample Survey/Stochastic Processes/Experimental Design/Population and Health Studies
4	Prof. A. S. Ajiboye	B.Sc., (Zaria), M.Sc. (Ibadan), Ph. D (Ibadan)	Professor	Operations Research/Multivariate Statistics/Quality Control
5	Prof. A. A. Akomolafe	B.Sc., (Ilorin), M.Sc., Ph. D (Ibadan)	Professor	Statistical Inference/ Probability Distributions / Population and Health Studies
6	Prof. O. O. Alabi	B.Sc.,(Ilorin), M.Sc.,(Ibadan), Ph. D (Ilorin).	Professor	Econometrics Modelling /Time series/ Non-parametric and Semi-parametric Methods.
7	Prof. E. Gayawan	B.Sc., M.Sc., Ph. D (Ilorin),	Professor	Spatial Statistics/Biostatistics
8	Dr. A. H. Bello	B.Sc., (Ilorin), M.Sc., (Ago-Iwoye) Ph. D (Ogbomosho)	Reader	Econometrics/ Time Series
9	Dr. O. O. Ojo	B.Sc., M.Sc., Ph. D (Ibadan)	Senior Lecturer	Bayesian Inference/Statistical Machine Learning/ Computational Statistics/ Econometrics Modelling
10	Dr. Mrs. O. B. Aladeniyi	B.Sc. (Ilorin), M. Tech. (Akure), Ph. D (Ilorin)	Senior Lecturer	Biostatistics/ Spatial Statistics
11	Dr. B. M. Oseni	B. Tech., M. Tech., (Akure) Ph. D (Ilorin)	Senior Lecturer	Stochastic Processes / Probability Distributions / Econometrics / Biostatistics
12	Dr. A. O. Adepetun	B. Tech., M. Tech., (Akure) Ph. D (Ilorin)	Senior Lecturer	Sample Survey/ Bayesian Inference
13	Dr. P. O. Olopha	B. Sc., M.Sc. (Ibadan), Ph. D (Akure)	Senior Lecturer	Time Series/ Spatial Statistics
14	Dr. J. A. Kupolusi	B.Sc., M.Sc. (Ado- Ekiti), Ph. D (Akure)	Senior Lecturer	Experimental Design/Operations Research
15	Dr. Mrs. O. K. Bodunwa	B. Sc., (Abeokuta) M. Tech., Ph. D (Akure)	Senior Lecturer	Econometrics/ Experimental Design
16	Dr. E. I. Olamide	B.Sc. (Ado -Ekiti) M.Sc. (Ibadan), Ph. D (Akure)	Senior Lecturer	Experimental Design/Statistical Modelling / Machine Learning

11. LIST OF NON TEACHING STAFF

S/N	NAME	QUALIFICATION	STATUS
1	Mrs A. B. Omotoye	HND (Owo) PGD (Akure)	Assistant Chief Technologist
2	Mr. O.O. Ogungbola	HND (Ede) B.Sc. (Abeokuta), M. Tech (Akure)	Principal Technologist
3	Mr. D. S. Oluwadahunsi	B. Tech., PGD, M.Tech. (Akure)	Principal Technologist
4	Mrs. L. C. Udoh	HND (Idah), PGD, M. Tech (Akure)	Principal Technologist
5	Mrs. P. B. Akpobome	HND (Ede), PGD, M. Tech (Akure)	Technologist II
6.	Mrs. E. M. Ibitoye	5o words/min in Type writing and Shorthand, B.Ed (Ado-Ekiti), M.Ed (Akungba)	Deputy Chief Secretariat Assistant
6	Miss. R. Uzoezie	B.Sc. (Awka), PGD (Akure)	Head Laboratory Assistant

INSTITUTE OF TECHNOLOGY-ENHANCED-LEARNING AND DIGITAL HUMANITIES (INTEDH)

POSTGRADUATE DIPLOMA PROGRAMMES (PGD) IN COMMUNICATION

1. PROGRAMMES OFFERED

(a) Postgraduate Diploma in Science and Development Communication
(b) Postgraduate Diploma in Technical Communication
(c) Postgraduate Diploma in Digital Literacy

2. PROGRAMME PHILOSOPHY

The Institute of Technology-Enhanced Learning and Digital Humanities (INTEDH) is committed to a higher education environment that fosters transformative and reflexive practices in learning and teaching; it strives to create a socially responsive and contextually relevant teaching and learning environment. The key focus areas include: staff development, course and curriculum design and re-design, and educational technology integration.

3. PROGRAMME OBJECTIVES

The objectives of the programme include the training and re-training of communication professionals who can combine sound theoretical knowledge with sophisticated practical skills in communication to meet Nigeria's development and technical communication needs in a wide variety of areas.

a. Science and Development Communication

Upon graduation, products who specialise in Science and Development Communication will:

i. demonstrate an understanding of the social and cultural consequences of globalisation processes through in-depth study of specific case studies of communication for development/social change in their local, regional and global context, in-depth knowledge of a variety of methods - from analysis of texts to ethnography and action research - engaging with analyses of communication, learning processes/pedagogy, and cultural conditions;
ii. write effectively for both specialist and non-specialist audiences using a wide range of formats and media; and
iii. demonstrate knowledge of important strands of theory in communication and cultural studies (such as participatory communication, semiotics and discourse analysis), and their integration with, and practical application in, communication for development processes.

b. Technical Communication

Upon graduation, products who specialise in Technical Communication will

i. combine technical know-how and excellent communication skills in English to meet the challenges posed by the interconnection of science and technology and the English language in various fields of endeavour such as science, engineering, and business;
ii. be able to plan, design, create and develop different types of technical manuals as well as managing all technical communications, using the computer and other modern high-tech facilities; and
iii. be technical communicators capable of carrying out research to enhance communication.

c. Digital Literacy

i. Upon graduation, graduates of the postgraduate diploma programme in Digital Literacy can function well in the twenty-first century workplace, wherever that may be.

4. PROGRAMME JUSTIFICATION

The uniqueness of the postgraduate diploma programmes consists of the following:

a. They all incorporate twenty-first century skills to help people meet the challenges of globalisation.
b. The postgraduate diploma programme in Digital Literacy provides capacity for the twenty-first century workplace
c. The postgraduate diploma programme in Technical Communication and Development Communication Studies will serve as a transition for candidates without a degree in Language, Communication or related areas.
d. All of them are taught in a blended learning mode, with digital learning technologies form a substantial part of the medium of learner-teacher and learner-learner interaction.

5. ADMISSION REQUIREMENTS

For all Postgraduate Diploma courses, candidates are required to possess

i. a first degree not lower a Third-Class Honours degree in any subject area, or
ii. a Credit in Higher National Diploma in any area from institutions recognised by the Senate of The Federal University of Technology, Akure.

6. PROGAMME DURATION

The PGD programmes are full-time programmes of eighteen (18) months of three semesters duration each.

7. GRADUATION REQUIREMENTS

To be qualified for a Postgraduate Diploma in Technical Communication, Science and Development Communication or Digital Literacy, a candidate must have:

i. passed a minimum TLU of 36, including 6 units of research project and 30 units of compulsory or core courses;
ii. successfully presented 2 Departmental Research Project seminars
iii. successfully defended the Research Project in the specialist area at an oral examination organised by the School of Postgraduate Studies.

8. COURSE OUTLINE

A. POSTGRADUATE DIPLOMA IN SCIENCE & DEVELOPMENT COMMUNICATION

First Semester

Course Code	Course Status	Course Title	L	T	P	U
COM 701	C	Research Methods and Ethics	2	0	0	2
COM 703	C	Basics of Philosophy, Language and Communication	2	0	0	2
COM 705	R	Facilitating Online	0	0	3	1
COM 707	C	Introductory Science Communication for Development .	2	0	0	2
COM 709	C	Basic Communication Theories	2	0	0	2
COM 715	C	Communication in Conflict situations	2	0	0	2
ESP 703	C	Discourse Analysis and Pragmatics	2	0	0	2
ESP 707	C	Writing Skills	1	0	3	2
	E	Elective course				2
TOTAL						17

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

Course Code	Course Status	Course Title	L	T	P	U
COM 717	E	Public Relations	2	0	0	2
COM 727	E	Fundamentals of Data Communication	2	0	0	2
ESP 711	E	Basics of Stylistics	2	0	0	2

Second Semester

Course Code	Course Status	Course Title	L	T	P	U
COM 702	C	Professional Communication	2	0	0	2
COM 704	C	New Media and Development	3	0	0	3
COM 706	C	Gender Matters in Development Policy	2	0	0	2
COM 708	C	Principles of Human Development	2	0	0	2
COM 710	C	Seminar	2	0	0	2
SOC 702	C	Statistics for the Social and Behavioural Sciences	2	0	0	2
APE 706	C	Logic and Critical Reasoning	2	0	0	2
	E	Elective course				2
TOTAL						17

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

Course Code	Course Status	Course Title	L	T	P	U
COM 714	E	Advertising	2	0	0	2
SOC 712	E	Introduction to Technology and Social Change	2	0	0	2

Third Semester

Course Code	Course Status	Course Title	L	T	P	U
COM 799	C	Postgraduate Diploma Project	0	0	18	6
TOTAL						6

B. POSTGRADUATE DIPLOMA IN TECHNICAL COMMUNICATION

First Semester

Course Code	Course Status	Course Title	L	T	P	U
COM 701	C	Research Methods and Ethics	2	0	0	2
COM 703	C	Basics of Philosophy, Language and Communication	2	0	0	2
COM 705	R	Facilitating Online	0	0	3	1
COM 709	C	Basic Communication Theories	2	0	0	2
COM 711	C	Introduction to Technical Communication	2	0	0	2
COM 713	C	Introduction to Technical Writing and Editing	2	0	0	2
ESP 703	C	Fundamentals of Discourse Analysis and Pragmatics	2	0	0	2
ESP 707	C	Writing Skills	1	0	3	2
	E	Elective course				2
TOTAL						17

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

Course Code	Course Status	Course Title	L	T	P	U
COM 717	E	Public Relations	2	0	0	2
COM 727	E	Fundamentals of Data Communication	2	0	0	2
ESP 711	E	Basics of Stylistics	2	0	0	2

Second Semester

Course Code	Course Status	Course Title	L	T	P	U
COM 702	C	Professional Communication	2	0	0	2
COM 704	C	New Media and Development	3	0	0	3
SOC 702	C	Statistics for the Social and Behavioural Sciences	1	1	0	2
COM 710	C	Seminar	2	0	0	2
COM 712	C	Introductory Computer Graphics and Internet Publishing	1	0	3	2
COM 716	C	Fundamentals of Visual Communication	1	0	3	2
APE 706	C	Logic and Critical Reasoning	2	0	0	2
	E	Elective course				2
TOTAL						17

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

Course Code	Course Status	Course Title	L	T	P	U
COM 714	E	Advertising	2	0	0	2
SOC 712	E	Introduction to Technology and Social Change	1	1	0	2

Third Semester

Course Code	Course Status	Course Title	L	T	P	U
COM 799	C	Postgraduate Diploma Project	0	0	18	6
TOTAL						6

C. POSTGRADUATE DIPLOMA IN DIGITAL LITERACY

First Semester

CORE COURSES

Course Code	Course Status	Course Title	L	T	P	U
COM 701	C	Research Methods and Ethics	2	0	0	2
COM 703	C	Basics of Philosophy, Language and Communication	2	0	0	2
COM 705	R	Facilitating Online	0	0	3	1
COM 719	C	Introduction to twenty-first literacies	2	0	0	2
COM 721	C	Introduction to cyber security and online safety	2	0	0	2
COM 723	C	Aspects of critical digital literacy:	2	0	0	2
COM 725	C	Ethical and legal issues in the use of digital content	2	0	0	2
ESP 707	C	Writing Skills	1	0	3	2
	E	Elective course				2
TOTAL						17

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

Course Code	Course Status	Course Title	L	T	P	U
COM 727	E	Fundamentals of Data Communication	2	0	0	2
ESP 711	E	Basics of Stylistics	2	0	0	2

Second Semester

Course Code	Course Status	Course Title	L	T	P	U
COM 704	C	New Media and Development	3	0	0	3
SOC 702	C	Statistics for the Social and Behavioural Sciences	1	1	0	2
COM 710	C	Seminar	2	0	0	2
COM 718	C	Content Creation and Content Reception	2	0	0	2
COM 720	C	Critical Analysis of Media Content	2	0	0	2
COM 724	C	Internet Collaboration	2	0	0	2
APE 706	C	Logic and Critical Reasoning	2	0	0	2
	E	Elective course				2
TOTAL						17

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

Course Code	Course Status	Course Title	L	T	P	U
SOC 712	E	Introduction to Technology and Social Change	1	1	0	2
ESP 714	E	English in Nigeria and the National Language Question	2	0	0	2

Third Semester

Course Code	Course Status	Course Title	L	T	P	U
COM 799	C	Postgraduate Diploma Project	0	0	18	6
						6

9. COURSE SYNOPSES

COM 701 Research Methods and Ethics (2 Units)
Definition and concepts of research. Research process. Research design. Literature review. Sampling. Reliability and validity of data. Qualitative and quantitative research methods. Research reporting. Definition of ethics. Definition of science. Definition of ethics in science. What is a profession? How ethics and values intersect with professionalism. Ethical theory and applications. Standards of ethical conduct in science. Common ethical principles in science. Fraud in science. Whistle blowing. Conflict of interest. Case studies

COM 702 Professional Communication (2 Units)
Rhetorical concepts and processes to successfully communicate individually and collaboratively via written, oral, visual, and electronic modes across a range of business disciplines. Covers strategies for analysing audiences internal and external to an organisation in order to communicate positive, neutral, and negative messages clearly, completely, correctly, and ethically; save an audience's time; and create goodwill. Analysis and criticism of political discourse using theories and methods from the discipline of speech communication.

COM 703 Basics of Philosophy, Language and Communication (2 Units)
The nature of language and human communication. The role of language in the development of knowledge. The character of concepts and their role in the organisation of human experience. The problem of the objectivity of meaning and the possibility of inter-cultural translation of ideas

COM 704 New Media and Development (3 Units)
Media literacy; the role of new media and Information and Communication Technologies (ICT) for development, significance of the digital revolution in a global perspective, with special regard to governance and civic participation; ICT in international development cooperation; analysis and theorisation of new media and ICT media and communication studies.

COM 705 Facilitating Online (1 Unit)
A model for online facilitation; Building interaction into webinars; Scheduling facilitation; Exploring facilitation; Facilitating and hosting webinars; Gaining ideas for self-paced online activities; Developing ways of working together as a group; Creating an online activity; Adventure into the World Wide Web

COM 706 Gender Matters in Development Policy (2 Units)
Gender Inequality Issues. Gender and Poverty Levels. Measurement of Gender Empowerment Index. Measurement of Gender Development Index. Gender Empowerment and Development Indices in Nigeria. Gender-Related Policy Options in Human Development and Agrarian Programmes. Strategies for Implementing Gender-biased Programmes.

COM 707 Introductory Science Communication for Development (2 Units)
Overview of science communication in the 21st century; Science writing: structuring articles and reports, writing effectively for both specialist and non-specialist audiences; Use of oral presentations and displays to communicate science; Use of emerging online social media in science communication

COM 708 Principles of Human Development (2 Units)
Facets of Human Development Gender Perspective in Human Development (Nigeria, Africa, and Global Status). Measurement of Human Development Index (HDI). Poverty as a human development problem; Perspectives of Poverty. Human Poverty and Income Poverty. Measurement of Human Poverty Index (HPI). Poverty Alleviation Policies. The Status of Human Development in Nigeria. Strategies for Enhancing Human Development Index (World Regional Models inclusive.)

COM 709 Basic Communication Theories (2 Units)
The contemporary theories of Mass Communication – Individual Differences Theory, Social Categories Theory, Social Relations Theory, The Cultural Norms Theory, Theories of Media Violence, Catharsis Theory, Observation Learning Theory.

COM 710 Seminar (2 Units)
Seminar presentations on approved topics in the area of technical and professional communication

COM 711 Introduction to Technical Communication (2 Units)
A broad introduction to the culture of professional work as a technical communicator, with particular emphasis on principles and best practices for developing and managing technical information and digital media. Examination of user-centred design, the history of Technical Communication, cross-cultural communication, and the ethics of communicating complex information to lay audiences. Study and practice of team-based collaboration, project management, and technical editing.

COM 712 Introductory Computer Graphics and Internet Publishing (2 Units)
Introduction to Computer Graphics; Raster Graphics; Clipping; Polygon Clipping and polygon scan conversion; Transformations; 3D viewing; Curves; Surfaces; Hierarchical Models; Rendering; Ray tracing; Hidden Surface Elimination; Fractals; Computer animations. Rendering of primitive objects. Polygon clipping algorithms. Two-dimensional transformations. Three-dimensional transformations.

COM 713 Introduction to Technical Writing and Editing (2 Units)
Fundamentals of writing, designing and communication of technical information for various audiences focusing on technical writing conventions such as organisation, style and tone. Production of graphics and the layout of documents. Writing Practice and Production of common technical documents. Designing effective technical documents for both written and digital media. Introductory copy editing. Grammar and mechanics. Practising editing skills.

COM 714 Advertising (2 Units)
The origin of Advertising. Economics and Social Role of Advertising. Public attitudes in Advertising. Marketing Evolution. The Basic principles of marketing. Relevance of market concept to Advertising. Product life cycle. Marketing segmentation and evaluation. Reaching Target Segment. Organisation of Advertising. Control and Regulation of Advertising.

COM 715 Communication in Conflict situations (2 Units)
Theories of Conflict. The role of communication in managing conflict in various relationships: interpersonal, inter-organisational, and international. Machinery for dispute settlement – mediation, reconciliation, arbitration and industrial courts. Reportage of conflict in Nigerian media

COM 716 Fundamentals of Visual Communication (2 Units)
Rhetorical strategies and perceptual principles for designing print and digital visual elements such as diagrams and graphs and integrating those visual elements into technical communications. Visual elements such as typeface, page and screen layout, and illustrations in order to make communications more usable. Communicating quantitative information using visual displays

COM 717 Public Relations (2 Units)
What is Public Relations? Evolution of PR: the Nigerian Experience. Corporate Public Relations. The Public Relations Process, Public Opinion, Propaganda, Persuasive Communication Techniques. Public Relations as Management Function. Corporate Publicity. Public Relations Periodicals. Production of House Organs. Ethics of Public Relations.

COM 718 Content creation and content reception (2 Units)
Digital content creation; the socio-cultural contexts of digital content creation; the purposes of digital publishing; formats of online publication; educational consequences of digital content creation; using digital imagery, choice of digital media and influences on consumer patterns.

COM 719 Introduction to twenty-first century literacies (2 Units)
Digital Literacy; theories and models of digital literacy; tool literacies and literacies of representation; Developing digital literacies; embedding literacies into study, work and the social space

COM 720 Critical analysis of media content (2 Units)
Democratisation of the internet; content creation and distribution platforms: WordPress, Scribd, Weebly, Storify, YouTube; Verification of social media. Fake news, deepfakes

COM 721 Introduction to cyber security and online safety (2 Units)
Online rights and risks; security: Basic concepts of threats, vulnerabilities, controls; risk; confidentiality, integrity, availability; security policies; security mechanisms; Data Security and protection: concept, creating strong passwords; how to stay safe when surfing on internet: "In private Browsing", identifying secure website, clearing cookies; How to identify a secure web site; Security Considerations: Security threats from web sites;, DOS, DDOS; phishing, basics of software licensing

COM 722 Internet collaboration (2 Units)
Cloud services and their basic functions; Team building and effective communication, communicating online; participating in online meetings; using online discussion boards; using digital collaboration tools: packages in the Microsoft suite for written communication; Skype and Zoom for online communication; collaboration planning tools; smart phone applications Common collaborative platforms: Moodle; management of digital content

COM 723 Aspects of critical digital literacy (2 Units)
Information and critical literacy; bias and influence online; evaluating online sources for academic purposes, Netiquette.

COM 725 Ethical and legal issues in the use of digital content (2 Units)
Digital Ownership and Intellectual Property; Copyright, Patents, and Trademarks; Fair Use; Creative commons; software piracy; Privacy and Data Gathering; Censorship and Blocking; Security Liability

COM 727 Fundamentals of data communication (2 Units)
Fundamentals of Data Communications. Networking Terms and Concepts, Transmission Media, Network Topologies and Architectures. Connectivity Devices and Transfer Mechanism, Internet and Transport Protocols. Networking Standards, Addressing and Subnetting

COM 799 Postgraduate Diploma Project (6 Units)
An original investigation in an area of technical or professional communication, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge.

MASTER'S PROGRAMMES IN COMMUNICATION STUDIES

1. PROGRAMME OPTIONS
This programme mounts Master's courses as stipulated below:

i. Master of Science in Science and Development Communication
ii. Master of Science inTechnical Communication

2. PROGRAMME PHILOSOPHY
The Institute of Technology-enhanced Learning and Digital Humanities (INTEDH) is committed to a higher education environment that fosters transformative and reflexive practices in learning and teaching; it strives to create a socially responsive and contextually relevant learning and teaching environments. The key focus areas include: course and curriculum design and re-design supported with technology, and educational technology integration.

3. PROGRAMME OBJECTIVES
The specific objectives of the programme include the training and re-training of communication professionals who can combine sound theoretical knowledge with sophisticated practical skills in communication to meet Nigeria's development and technical communication needs in a wide variety of areas. The master's and doctoral programmes will produce professionals who can serve wherever communicative expertise is required, including higher education, mass media, multinationals, governmental and nongovernmental organisations, and who will utilise requisite technologies and affordances in 21st century skills workplace.

SPECIFIC OBJECTIVES
A. Science and Development Communication Option
Upon graduation, graduates who specialise in Development Communication will demonstrate:

(a) an understanding of the social and cultural consequences of globalisation processes through in-depth study of specific case studies of communication for development/social change in their local, regional and global context, in-depth knowledge of a variety of methods - from analysis of texts to ethnography and action research - engaging with analyses of communication, learning processes/pedagogy, and cultural conditions.

(b) knowledge of important strands of theory in communication and cultural studies (such as participatory communication, semiotics and discourse analysis), and their integration with, and practical application in, communication for development processes.

B. Technical Communication Option

Upon graduation, products who specialise in Technical Communication will

(a) combine technical know-how and excellent communication skills in English to meet the challenges posed by the interconnection of science and technology and the English language in various fields of endeavour such as science, engineering, and business;

(b) be able to plan, design, create and develop different types of technical manuals as well as managing all technical communications, using the computer and other modern high-tech facilities; and

(c) be technical communicators capable of carrying out research to enhance communication.

4. PROGRAMME JUSTIFICATION

The programmes in communication emphasise the common methodological outlook of the digital humanities and are thus able to address and engage disparate subject matters across media, language, location, and history. The programmes are unique in carrying out the practice of humanities research in and through information technology, and they explore how the humanities are transformed through their engagement with technology, media, and computational methods. Students will be exposed to a collection of practices in which print is not prioritised as the medium in which knowledge is generated or shared but digital tools, techniques, and media alter the production and dissemination of knowledge in the arts, human and social sciences. To this end, all courses are taught in a blended learning mode, and digital learning technologies form a substantial part of the medium of learner-teacher, and learner-learner interaction.

5. ADMISSION REQUIREMENTS

For Master of Science in Science and Development Communication or Technical Communication, admission requirements include:

i. Holders of a good Bachelor's degree in Language, Communication or related courses with a minimum of Second (2nd) Class Lower Division from a recognised University;

ii. A good Bachelor's degree with a minimum of Second (2nd) Class Lower Division in any area from a recognised university, plus a Postgraduate Diploma in Technical Communication, Science and Development Communication or Digital Literacy of FUTA or other recognised university.

iii. AThird-Class Honours degree in any subject area, or a Credit in Higher National Diploma in any area from institutions recognised by the Senate of The Federal University of Technology, Akure, plus a Postgraduate Diploma in Technical Communication, Science and Development Communication or Digital Literacy of FUTA or other recognised university.

6. PROGAMME DURATION

The Master's programmes are full-time programmes of eighteen to twenty-four (18 - 24) months of three to four (3 - 4) semesters duration each.

7. GRADUATION REQUIREMENTS

To be qualified for a Master of Science in either Technical or Development Communication, a candidate must have:

i. Completed a course of 18-24 months duration of three or four semesters for full-time study;

ii. passed a minimum TLU of 40, including 12 units of research project and 28 units of compulsory or core courses;

iii. successfully presented three(3) Departmental Research Project seminars

iv. successfully defended the Research Project in the specialist area at an oral examination organised by the School of Postgraduate Studies.

Master of Science in Science and Development Communication Option

8. COURSE OUTLINES

First Semester

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 801	Research Methodology and Academic Ethics	C	3	0	0	3
COM 803	Philosophy, Language and Communication	C	3	0	0	3
COM 805	Introduction to Development Communication	C	3	0	0	3

COM 807	Theories and Concepts in Media and Communication	C	3	0	0	3
COM 809	Communicating Science for Development	C	3	0	0	3
SOC 803	Advanced Social and Behavioural Statistics	C	2	1	0	3
	(Elective of at least 2 units)	E				2
	TOTAL					20

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
ESP 803	Discourse Analysis and Pragmatics	E	2	0	0	2
SOC 813	Health Communication	E	2	1	0	3
COM 811	Stylistics	E	2	0	0	2

AUDITED COURSE: Only for candidates who have not taken it previously

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 705	Facilitating Online	[1]AUDITED	0	0	3	1

Second Semester

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 802	Language and Communication in Peace and Conflict Resolution	C	3	0	0	3
COM 804	Critical Approaches to Media, Communication and Development	C	3	0	0	3
COM 806	Communication, Culture and Media Analysis	C	3	0	0	3
COM 808	New Media, ICT and Development	C	3	0	0	3
COM 810	Special topics in Development or Technical Communication (Seminar)	C	3	0	0	3
	(Elective of at least 2 units)	E				2
	TOTAL					17

[1]Only for candidates who have not taken the course previously.

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 812	Language Rights Issues in Development Communication	E	2	0	0	2
SOC 816	Technology and Social Change	E	2	1	0	3

Third Semester

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 899	Master's Dissertation (Research Project)	C	0	0	36	12
	TOTAL					12

9. COURSE SYNOPSES

COM 705 Facilitating Online (AUDITED COURSE) (1 unit)

A model for online facilitation; Building interaction into webinars; Scheduling facilitation; Exploring facilitation; Facilitating and hosting webinars; Gaining ideas for self-paced online activities; Developing ways of working together as a group; Creating an online activity; Adventure into the World Wide Web

COM 801 Research Methodology and Academic Ethics (3 Units)

Steps in social science research; defining research problem and guidelines; developing specific objectives; hypotheses writing; categories of research design; concept of variables; sampling techniques; methods of data collection; roles of related literature in research; data analysis and interpretation; measurement and evaluation; levels of measurement; validity and reliability; types of rating scale; test construction and item analysis; measurement

of socio-economic status; measurement of innovation adoption; techniques of attitude scale construction; Likert method of scaling; conversion of descriptive ratings to standard stores; sources, documentation and referencing; academic dishonesty; unauthorised collaboration; plagiarism, types and prevention; fair use of the internet; data falsification.

COM 802 Language and Communication in Peace and Conflict Resolution (3 Units)
The role of communication in managing conflict in various relationships: interpersonal, inter-organisational, and international. Special emphasis is given to how the application of communication processes like negotiation can influence outcomes. Current cases are studied to reveal how organisational leaders incorporate ethical decisions and strategic communication in conflict and change management; linguistic dimensions of ethnicity and features of power play between majority and minority language speakers; issues in identity, security and insecurity; language in legal arbitration and the administration of justice and conflicts within case studies of ethno-linguistic conflicts and resolutions of language planning frameworks as in the former Soviet Union, India, South Africa, Switzerland.

COM 803 Philosophy, Language and Communication (3 Units)
Introduction to the philosophy of language; the nature of meaning, truth and reference; how linguistic communication works.The nature of language and human communication.The role of language in the development of knowledge.The character of concepts and their role in the organisation of human experience.Thecognitive role of metaphors and the links between language-use and power structures.The problem of the objectivity of meaning and the possibility of inter-cultural translation of ideas.

COM 804 Critical Approaches to Media, Communication and Development (3 Units)
The history of and tensions between 'media for development' and 'communication for development', Critical assessment on mainstream development perspectives on aid, modernisation, and the role of media and communication in low-income countries and unequal social contexts. Conflictual relationships between economic and political power structures and the empowerment of individuals/groups within their local and regional contexts.Role of history, colonisation, race and gender in media portrayal.Ideology, discourse, orientalism, reflexivity and power in a critical understanding of social life, participation and change in the global south. The use of media, information, and communication strategies, and information and communication technology applications, as means of alleviating poverty and fostering democracy and human rights in low-income countries.

COM 805 Introduction to Development Communication (3 Units)
What development communication is; History of development communication; Approaches and theories of development communication; Strategies and models of development communication; Sustainable Development perspectives; Types of communication and their roles; Communication Dimensions; Communication Behaviour of Individuals and Small groups; Mass Mediated Communication; Communication strategies; Role of communication in development; Fundraising communications media: case statements, annual fund appeal letters, proposals, and research reports. audio, video, and other media; Designing communication strategies to handle developmental problems such as report-writing skills and podcast creation.

COM 806 Communication, Culture and Media Analysis (3 Units)
Relationship between development cooperation organisations and their communication for development initiatives and strategies, communication policies and practices of selected development organisations and movements, theories related to communication, culture and media analysis, with particular focus on representation, and different theories of communication and development, and a deeper understanding of the integration of both traditions and their practical application.

COM 807 Theories and Concepts in Media and Communication (3units)
This course is a survey of key concepts and interdisciplinary approaches. Addresses key theoretical and conceptual issues in the study of media and communications, within a broadly interdisciplinary social science perspective. Topics include Theory of media and communication, including the relation between media, culture and identity is in different areas of the field (media studies, social/cultural studies and strategic communication/organisational studies); Theories of agenda-setting and framing; Media as a tool of soft power and propaganda; Theorising about social media and networked society: Media in the international context: on intercultural differences.

COM 808 New Media, ICT and Development (3 Units)

Media literacy; the role of new media and Information and Communication Technologies (ICT) for development, significance of the digital revolution in a global perspective, with special regard to governance and civic participation; 'informatisation' as a development strategy, and for using ICT in international development cooperation; analysis and theorisation of new media and ICT media and communication studies. To conceptualise ICT for development, with emphasis on the relationship between technology and development in particular socio-political situated contexts; different perspectives on development and the manner in which we can understand ICTs from these perspectives; To analyse the nature of ICT applications in different development domains such as health, education, water and sanitation, and migration; To analyse various approaches to evaluate the outcome of ICT for Development projects

COM 809 Communicating Science for Development (3 Units)

Theoretical aspects of science communication and effective engagement. rationale for science communication, and whose interests are being furthered; understanding and engaging audiences; identifying what to communicate and how best to do this; the role and practices of the mass media; the ethics of science communication; and the importance and techniques of effective evaluation. specific media and their potential and constraints; communication and engagement techniques including writing, social media, visual media and broadcasting.

COM 810 Special Topics in Development/Technical Communication (Seminar) (3 Units)

Students will explore different dimensions of development or technical communication, including health and gender, activism, humanitarianism, and social change, ICT and open development, inequality, global poverty and hunger, environment and sustainability; techniques of internet fraud, computer animation, social media memes, social media marketing,

COM 811 Stylistics (2 units)

Introduction to Stylistics.The use of Stylistics.The development of Stylistics.The theories of style – Deviation, Monism, Pluralism.Style as Discourse – Field, Tenor, Mode.Style as Functions of Language (Pluralism).Aspect of Stylistic Analysis – Lexical Categories, Grammatical Categories, Figure of Speech, Cohesion and Coherence. Computational stylistics: methodological considerations, corpus stylistics and digital hermeneutics; GIS mapping of author's works; digital storytelling and the internetting of literature; use of visualization software:Voyant, R, Tagcrowd

COM 812 Language Rights Issues in Development Communication (2 units)

Definitions of development; linguistic aspects of human rights; linguistic dimensions of development; literacy rates and development; language, traditional knowledge systems, spiritual and material culture; language policy and language attitudes; implications of exclusion; language planning; lexical expansion, terminology development and translation

COM 899 Master's Dissertation (12 units)

An original investigation in an area of development communication, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge.

Master of Science in Technical Communication Option

8. COURSE OUTLINE

First Semester

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 801	Research Methodology and Academic Ethics	C	3	0	0	3
COM 803	Philosophy, Language and Communication	C	3	0	0	3
COM 807	Theories and Concepts in Media and Communication	C	3	0	0	3
COM 831	Technical Writing and Editing	C	3	0	0	3
COM 833	Professional Communication for Specific Purposes	C	2	0	0	2
SOC 803	Advanced Social & Behavioural Statistics	C	2	1	0	3
	Elective	E				2
	TOTAL					19

ELECTIVE COURSES

Students are expected to take at least one elective course from this list

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 835	Data Communication	E	2	0	0	2
COM 811	Stylistics	E	2	0	0	2
ESP 809	Discourse Analysis and Pragmatics	E	2	0	0	2

AUDITED COURSE: only for candidates who have not taken it previously

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 705	Facilitating Online	[2]AUDITED	0	0	3	1

Second Semester
CORE COURSES

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 810	Special topics in Development or Technical Communication (Seminar)	C	3	0	0	3
COM 830	Computer Graphics, Internet Publishing and Web Design	C	2	0	3	3
COM 832	Multimedia Presentations and Information Design	C	1	0	3	2
COM 834	Information Management & Security	C	3	0	0	3
COM 836	Visual Aspects of Technical and Professional Communication	C	2	0	3	3
	Elective of at least 3 units	E				3
	TOTAL					17

[2]Only for candidates who have not taken the course previously.

ELECTIVE COURSES

Students are expected to take at least one elective course from this list

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
SOC 816	Technology and Social Change	E	2	1	0	3
COM 812	Language Rights Issues in Development Communication	E	2	0	0	2

Third Semester
CORE COURSES

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 899	Master's Dissertation	C	0	0	36	12
	TOTAL					12

9. COURSE SYNOPSES

COM 830 Computer Graphics, Internet Publishing and Web Design (3 Units)

Introduction to Computer Graphics; Raster Graphics; Clipping; Polygon Clipping and polygon scan conversion; Transformations; 3D viewing; Curves; Surfaces; Hierarchical Models; Rendering; Ray tracing; Hidden Surface Elimination; Fractals; Computer animations. Rendering of primitive objects.Polygon clipping algorithms.Two-dimensional transformations.Three-dimensional transformations.Viewing camera.Rendering and projections. Object representations. Three-dimensional curve and surface rendering algorithms.Line and surface removal algorithms.Fundamental concepts and contexts in internet publishing.Tools for managing websites.Planning and completion of web pages.

COM 831 Technical Writing and Editing (3 Units)

Fundamentals of writing, designing and communication of technical information for various audiences focusing on technical writing conventions such as organisation, style and tone.Production of graphics and the layout of documents.Writing Practice and Production of common technical documents.Designing effective technical documents for both written and digital media.Introduction to principles of audience analysis, research and documentation, drafting and revision processes, readability and accessibility of written texts and basic web technologies. Role of professional editors in the contemporary workplace.Principles, symbols and

methods of copy editing.Grammar and mechanics.Practising editing skills.Substantive editing.Editing considerations.Editing visual designs and illustrations.Editing technical materials.

COM 832 Multimedia Presentations and Information Design (2 Units)
Integration of animation, audio and video content to maximise communications. Basic applications of various multimedia tools to create visual, aural, and written projects in both digital and print formats

COM 833 Professional Communication for Specific Purposes (2 Units)
A study of various communication styles and approaches in today's workplace to include digital, verbal and nonverbal communicationwith an examination of the accompanying communication problems. The evaluation of case analysis and discussion and on practical business and professional communication skills, including writing, speaking, and listening. Emphasis is on clarity, organization, format, appropriate language, and consideration of audience, for both written and oral communication.

COM 834 Information Management & Security (3 Units)
Information literacy skills.Managing information services.Database construction and use.Knowledge organisation. Networking and records management. Students will embark on a professional field trip. Overview of the threats to the security of information systems, the security responsibilities faced by users and managers of computer systems, the discussion of basic tools available for implementing computer security, and consideration of the ethical and legal responsibilities facing computer users. In-depth analysis/design of specific security tools and network security.

COM 835 Data Communication (3 Units)
Fundamentals of Data Communications.Networking Terms and Concepts, Transmission Media, Network Topologies and Architectures.Connectivity Devices and Transfer Mechanism, Internet and Transport Protocols.Networking Standards, Addressing and Subnetting. Management strategies for flow control. Multimedia communications and quality of service; Network measurement, inference, and management; Network experimentation and performance analysis; Network security; Protocol verification.

COM 836 Visual Aspects of Technical and Professional Communication (3 Units)

Rhetorical strategies and perceptual principles for designing print and digital visual elements such as diagrams and graphs and integrating those visual elements into business and technical communications.Covers strategies for employing visual elements such as typeface, page and screen layout, and illustrations in order to make communications more usable. Communicating quantitative information using visual displays; visualising data; interactive and dynamic data displays; evaluating current examples in the media; colour, perception, and representation in graphs; interpreting data displays.

COM 899 Master's Dissertation (12 units)
An original investigation in an area of technical communication, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge.

DOCTOR OF PHILOSOPHY IN COMMUNICATION

1. DOCTORAL PROGRAMMES IN COMMUNICATION STUDIES

A. *Doctor of Philosophy*
(a) PhD in Technical Communication
(b) PhD in Development Communication

2. PROGRAMME PHILOSOPHY

The Institute of Technology-enhanced Learning and Digital Humanities (INTED) is committed to a higher education environment that fosters transformative and reflexive practices in learning and teaching; it strives to create a socially responsive and contextually relevant learning and teaching environments. The key focus areas include: course and curriculum design and re-design supported with technology, and educational technology integration.

3. PROGRAMME OBJECTIVES

The specific objectives of the programme include the training and re-training of communication professionals who can combine sound theoretical knowledge with sophisticated practical skills in communication to meet Nigeria's development and technical communication needs in a wide variety of areas. The master's and doctoral programmes will produce professionals who can serve wherever communicative expertise is required, including higher education, mass media, multinationals, governmental and nongovernmental organisations, and who will utilise requisite technologies and affordances in 21st century skills workplace.

SPECIFIC OBJECTIVES

C. Development Communication Option

Upon graduation, graduates who specialise in Development Communication will demonstrate:

(a) an understanding of the social and cultural consequences of globalisation processes through in-depth study of specific case studies of communication for development/social change in their local, regional and global context, in-depth knowledge of a variety of methods - from analysis of texts to ethnography and action research - engaging with analyses of communication, learning processes/pedagogy, and cultural conditions.

(b) knowledge of important strands of theory in communication and cultural studies (such as participatory communication, semiotics and discourse analysis), and their integration with, and practical application in, communication for development processes.

D. Technical Communication Option

Upon graduation, products who specialise in Technical Communication will

(a) combine technical know-how and excellent communication skills in English to meet the challenges posed by the interconnection of science and technology and the English language in various fields of endeavour such as science, engineering, and business;

(b) be able to plan, design, create and develop different types of technical manuals as well as managing all technical communications, using the computer and other modern high-tech facilities; and

(c) be technical communicators capable of carrying out research to enhance communication.

(d) a collection of practices in which print is not prioritised as the medium in which knowledge is generated or shared but digital tools, techniques, and media alter the production and dissemination of knowledge in the arts, human and social sciences.

(e) To this end, all courses are taught in a blended learning mode, and digital learning technologies form a substantial part of the medium of learner-teacher, and learner-learner interaction.

5. ADMISSION REQUIREMENTS

PhD

For PhD in Technical Communication/Development Communication, suitable candidates will possess a Master's degree in:

(a) any one of Technical Communication, Development Communication, Communication Arts or Mass Communication.

(b) will have scored a minimum of 60% in the thesis as well as the overall result or CGPA of 3.5 or a 5-point scale.

4. JUSTIFICATION

(a) The programmes in communication emphasise the common methodological outlook of the digital humanities and are thus able to address and engage disparate subject matters across media, language, location, and history.

(b) The programmes are unique in carrying out the practice of humanities research in and through information technology, and they explore how the humanities are transformed through their engagement with technology, media, and computational methods.

(c) Students will be exposed to

6. PROGAMME DURATION

The durations of the PhD programmes is as follows:

PhD:

(a) Full-time: 36-48 months

(b) Part-time: 48-60 months

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 705	Facilitating Online	AUDITED	0	0	3	1

COM 999 Doctoral Thesis - 12 units

An original investigation in an area of development communication, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge. The dissertation must be defended at an open oral examination organised by the School of Postgraduate Studies.

POSTGRADUATE DIPLOMA PROGRAMMES (PGD) IN MEDICAL SOCIOLOGY AND POPULATION HEALTH

1. PROGRAMMES OFFERED

i. Postgraduate Diploma in Medical Sociology
ii. Postgraduate Diploma in Population Health

2. PROGRAMME PHILOSOPHY

The goal that Medical Sociology andPopulation Health graduate courses seek to achieve is to give Sociological perspectives on medicine and health issues which will allow students/learners engage with the social and cultural framing of what is defined as illness or diseases. These specializations specifically provide graduates with the understanding, insights scientific reasons behind major health setbacks and skills that will help to alleviate these problems by providing a foundation that is both biological and social to the aetiology/prognosis of disease especially as it is peculiar to the African culture. This knowledge when acquired is aimed at providing basic explanation that will lead to a healthy population when applied. The programme will connect theoretical fundamentals and critical analysis to applied technological output in the area of herbal and traditional medicine and the interactive dynamics between both traditional and orthodox healthcare providers and patients.

3. PROGRAMME OBJECTIVES

This Programme is designed to:

i. give opportunity to career development and enhancement in the area of medical sociology and population health to researchers who are in related fields and needs conceptual and theoretical explanation and understanding to improve their expertise;
ii. enable students understand and explain the major conceptual approaches to the study of health and illness as derivatives of both biological and social factors;
iii. bring to fore the necessity of marriage of convenience between herbal medicine technology and orthodox medicine;
iv. give opportunity to medical professionals and health officers who wish to have expertise on such areas to buttress their careers;
v. help government and policy makers in the area of health to understand the interwoven relationship between social institutions and health which will give them an opportunity to plan and execute better policies; and
vi. lead to degree of Master in Medical Sociology and Population health.

4. PROGRAMME JUSTIFICATION

i. It will enhance contemporary issues where reasons for population health are more of a combination of biological and social factors.
ii. The programme will more inform students about new technological skills necessary to enhance their career as health experts.
iii. The Programme will also give opportunity for further research studies in this area.
iv. It will allow researchers who originally were not in the fields but have a passion for it, to pursue their career.

5. ADMISSION REQUIREMENTS

i. Candidates are required to possess a good first degree in Sociology, Economics, Statistics, Medicine and Medical Sciences as well as Nursing or related courses,

ii. Credit in Higher National Diploma in related courses.

6. PROGRAMME DURATION

The PDG programme shall be a full-time programme of eighteen (18) months duration.

7. GRADUATION REQUIREMENTS

To qualify for the Postgraduate Diploma in Medical Sociology or Population Health, students should have:

i. Passed a minimum TLU of 36 units, including 6 units of Research Project and 30 units of compulsory, core and elective courses
ii. Successfully presented two seminar papers relevant to the area of specialization
iii. Successfully defended the Research Project in the specialist area at an oral examination organised by the School of Postgraduate Studies

8. COURSE OUTLINE

FIRST SEMESTER

Course Code	Status	Course Title	L	T	P	U
SOC 701	C	Introduction to Sociological Theory	2	1	0	3
SOC703	C	Introduction to Medical Sociology	2	1	0	3
SOC 705	C	Introduction to Social and Behavioural Methods	1	1	0	2
SOC 707	C	Introduction to Demography	1	1	0	2
ESP 711	R	Writing Skills	1	0	3	2
COM 705	R	Facilitating Online	0	0	3	1
		Total Electives				**4**
	Total					**17**

ELECTIVE COURSES

Students are to offer at least 2 electives as appropriate to their course of study

Course Code	Status	Course Title	L	T	P	U
SOC 709	E	Sociology of Deviant Behaviour	1	1	0	2
SOC 711	E	Rural Sociology	1	1	0	2
SOC 713	E	Population Health	1	1	0	2
SOC 715	E	Culture and Health	1	1	0	2

SECOND SEMESTER CORE COURSES

Course Code	Status	Course Title	L	T	P	U
SOC 702	C	Social and Behavioural Sciences	1	1	0	2
SOC 704	C	Traditional Therapeutics and System of Care	2	1	0	3
SOC 706	C	Introduction to Mental Health and Wellness	2	1	0	3
SOC 708	C	Seminar	0	0	6	2
APE 706	C	Logic and Critical Reasoning	1	1	0	2
		Total Electives (2)				4
	Total					16

ELECTIVE COURSES

Students are to offer at least 2 electives as appropriate to their course of study

Course Code	Status	Course Title	L	T	P	Units
SOC 710	E	Health, Environment and Sustainable Development	1	1	0	2
SOC 712	E	Introduction to Technology and Social Change	1	1	0	2
SOC 714	E	Culture and Society	1	1	0	2
SOC 716	E	Foundations of Social Epidemiology	1	1	0	2

THIRD SEMESTER

Course Code	Status	Course Title	L	T	P	Units
SOC 799	C	Project	0	0	18	6
	Total					**6**

9. COURSE SYNOPSES

SOC 701: Introduction to Sociological Theories (3 Units)

Sociology defined; Theory as a theme; importance of theories; Conceptualising meaning and scope of sociological perspectives; History and Origin of Sociology; Sociological Perspectives and the society; Sociology and other Social Sciences; Sociological theories- Conflict perspectives, Functionalism, Symbolic-Interactionism and Social Exchange theories; their major proponents and some relevant application in reality, Health promotion theories and programs. Conceptual framework.

SOC 702: Statistics for the Behavioural Sciences (2 Units)

Introduction to statistics; Frequency distribution; central tendency; Variability; Scores: location of scores and standardized distributions; probability; probability and samples: the distribution of sample; introduction to hypothesis testing; introduction to t-test statistics; the t-test for 2 independent samples; introduction to analysis of variance; correlation; introduction to regression; the chi-square statistics; the binomial test.

SOC 703: Introduction to Medical Sociology(3 Units)

Definition of Sociology and how it is related to medicine; Historical foundation of medical sociology; specific approaches of medical sociology i.e. difference between medical sociology and social medicine; theorising in medical sociology; professionalization and medicine; theories of disease; people's belief and interpretation of health and illness. The hospital as a social system; The sick role and the process of seeking medical care. Nursing and other health practitioners; Mental illness and mental hospital as a social institution.

SOC 704: Traditional Therapeutics and System of Care(3 Units)

Traditional Knowledge; Traditional Medicine; Complementary and Alternative Medicine; Sources and Characteristics of Traditional Medicine; Importance of Traditional Medicine; Magic and Medicine in Africa; Herbal Medicine; The African Man and Health Seeking Behaviour; Safety Issues and Policies in Traditional Medicine. Spiritual therapy; Traditional practitioners and practices e.g. general practitioners, oracle men/women, bone setters, traditional birth attendants, local psychiatrists, massagers and spiritual healers.

SOC 705: Introduction to Social and Behavioural Methods (2 Units)

What is research in the social science? Why research; Major types of social research; theory and research; the meaning of methodology; how to review the literature and conduct ethical research; strategies of research design; quantitative and qualitative sampling; experimental research; survey research; case study; field research and focus group discussion; in-depth interview etc.

SOC 706: Introduction to Mental Health and Wellness (3 Units)

Definition of mental health /wellness, distinction between mental health and mental illness personality traits, personality disorders e.g. antisocial personality disorder, borderline personality disorders, avoidant personality disorder, dependent personality disorder, suicidal personality disorders etc. An overview of mental health disorders, symptoms of mental health disorders, causes, Counseling Theories and application.

SOC 707: Introduction to Demography (2 Units)

The concepts and scope of demography; Theoretical models of population; Aspects of demography; Demography as a science; Importance of demography; The nature of population variables and its interaction with other socio-economic variables. The analysis of philosophy and method of planned development. The demographic background to development, planning, population growth, manpower and employment; population; rural and urban land use and migration; population and food production, population and health integration, family life and other services, population planning (family planning) and development. Development and Sustainable Development Goals (SDGs).

SOC 708: Seminar
(2 Units)

Seminarpresentation in the area of medical sociology or population health studies. Students are expected to have successfully presented a seminar paper in their area of specialization.

SOC 709: Sociology of Deviant Behaviour (2 Units)

Survey of theories of Deviant Behaviour with emphasis on cross-cultural studies. Attempt is made to evaluate extant theories of deviance in the light of empirical data of deviance from industrialized and non-industrialized of the emergent societies. Functions and dysfunctions of deviance in the society; A practical analysis of common deviant acts in Nigeria.

SOC 710: Health, Environment and Sustainable Development (2 Units)

The concepts of Health and the quality of life (QOL); Health and development; The concept of Development and Sustainable development; Development in Africa; Health and the sustainable development goals and targets. Environment and development defined; benefits of development to health e.g. improved child health, reduced child mortality and morbidity, etc. Health and development as one coin with two sides; Environmental hazards and implication on health

SOC 711: Introduction to Rural Sociology (2 Units)

Development of sociology, branches of sociology, definition of rural sociology and importance to national development. Concept of rurality, types of rural communities and settlements patterns, rural social interactions, livelihood and institutions. The rural people's health and implication for quality living.

SOC 712: Technology and Social Change; an Introductory Survey. (2 Units)

The concepts of technology and social change defined and fully explained. Technology as intertwined with societal growth and development; types of societies as typified by nature and extent of technology e.g. Pre-industrial, Industrial and post-industrial societies with their major characteristics; Theories of Social Change; Causes, effect and types of social change.

SOC 713: Population Health (2 Units)

Population health defined; Issues in Population health; Environmental Conflict and Peace Building; Health Needs of Special Groups; Fundamentals of Population Health Management; Adolescents' health issues; Sexual and Reproductive Health; Nutrition and Health; Health Policy and Population.

SOC 714: Culture and Society (2 Units)

Culture, its meaning and significance. Cultural attributes and their dynamics: Ecology, Language and mother tongue in society development; social, political and belief systems. Cultural development with special reference to human's recent cultural history. Becoming a member of a society by Socialization, enculturation; Conformity and Deviance; How society is organized via In-groups and Out-groups, reference group and networking; Social Organization and Social Institution.

SOC 715: Culture and Health (2 Units)

Clear and distinct definitions of culture and health; Sociocultural and Health belief model; Cultural impact on attitudes towards illness, disease and wellness; Culture and decision making in marriage, number of children, family planning utilization etc.

SOC 716: Foundations of Social Epidemiology (2 Units)

Social epidemiology defined. Historical antecedents of social epidemiology; Differential entities between social, biological and environmental factors in health and illness; Biological expressions of social inequality; Eco-social theory of disease distribution; Poverty, deprivation and social exclusion, stress and disease in the society; Theories of the disease distribution.

SOC 799: Project (6 Units)

Students are expected to engage in a research focused in their area of interest under a project supervisor as approved by the department.

POST GRADUATE MASTER'S PROGRAMME IN MEDICAL SOCIOLOGY AND POPULATION HEALTH

PROGRAMMES IN MEDICAL SOCIOLOGY AND POPULATION HEALTH

1. POSTGRADUATE PROGRAMME OPTIONS

The programme offers Master of Technology in:

a. Medical Sociology (M. Tech)
b. Population Health (M. Tech)

2. PROGRAMME PHILOSOPHY

The Institute of Technology Enhanced Learning and Digital Humanities (INTEDH) is unswerving in providing technological training to students in the area of health as a response to the dynamic nature of the current world. The curriculum is packaged to achieve a Sociological perspective through blended learning skills on medicine and health issues which will allow students/learners engage with the social and cultural framing of what is defined as illness or diseases. This knowledge when acquired is aimed at providing basic empirical proves that can have policy implications for a healthy population. The programme will connect theoretical fundamentals and critical analysis to applied technological output in the area of herbal and traditional medicine and the interactive dynamics between traditional and orthodox healthcare providers and patients.

3. PROGRAMME OBJECTIVES

The specific objectives of the programme include:

a. Career development and enhancement that is technologically enthused in the area of medical sociology and population health to researchers who are in related fields and needs conceptual and theoretical explanation and understanding to improve their expertise.
b. A full technologically compliant hybrid learning approach to the understanding of major conceptual intricacies of health and illness as derivatives of both biological and social factors.
c. Training on the necessity of marriage of convenience between herbal medicine technology and orthodox medicine.
d. The programme will give opportunity to medical professionals and health officers who wish to improve on their expertise in a renewed technological driven career development.
e. The curriculum stresses both qualitative and quantitative methodology, data collection, statistical analysis and comparative and historical research to bring out objectively the social context of health, illness and healthcare.

4. PROGRAMME JUSTIFICATION

i. Master's degree in Medical Sociology and Population Health is relevant and practical in today's world because graduates of these courses will be able to identify and understand the socio-cultural milieu of health issues.
ii. It will provide solutions that are indigenous, acceptable and easy to imbibe.
iii. It will enhance intellectual skills to use health data and design appropriate health promotion strategies.
iv. It will give opportunity for the evaluation of public health interventions objectively as well as working in collaboration with other professionals for effective outcome
v. It provides an easier platform to appraise resource allocation and cost issues in health and uphold ethical standards and more importantly, transcribing theoretical modules to practical learning session.

5. ADMISSION REQUIREMENTS

Academic requirements for the Master's degree in:

a. Medical Sociology
b. Population Health
   i. Holders of a good bachelor's degree in Sociology, Economics, Demography and Social Statistics, Geography or related disciplines with at least a Second (2nd) Class Lower Division from a recognised University.
   ii. A good first degree in a related discipline plus a Postgraduate Diploma in Medical Sociology or Population Health obtained from any recognised university

iii. Holders of PGD with Upper Credit in Medical Sociology or Population Health from INTEDH, FUTA and other recognised universities.

6. PROGRAMME DURATION

The duration of the programme shall be as follows:
Full-time: 24 months

7. GRADUATION REQUIREMENTS

To be qualified for a Master's degree in:

a. Medical Sociology
b. Population Health

Candidates must have fulfilled the following:

i. completed a minimum of three and a maximum of four academic semesters
ii. accumulated TLU of 50 units, including 12 units of Research Project, and 38 units of compulsory, core and elective courses.
iii. successfully presented two (2) Departmental Research Project seminars.
iv. successfully defended the Research Project in the specialist area at an oral examination organised by the School of Postgraduate Studies.
v. fulfil other conditions prescribed by the Board of Postgraduate Studies of the University.

8. COURSE OUTLINE

FIRST SEMESTER

Compulsory Courses (for all programmes)

Course Code	Status	Course Title	L	T	P	U
SOC 801	C	Sociological Theory	2	1	0	3
SOC 803	C	Social & Behavioural Statistics	2	1	0	3
SOC 805	C	Medical Sociology	2	1	0	3
SOC 807	C	Social Demography	2	1	0	3
ESP 813	R	Advanced writing skills and document design	1	1	0	2
COM 805*	R	Facilitating Online Course	1	0	0	1
		Total Electives (2)				**6**
	Total					**15**

Students are expected to take at least two elective courses

Elective Courses for both Medical Sociology and Population Health.

Course Code	Status	Course Title	L	T	P	U
SOC 809	E	Sociology of Health and Illness Behaviour	2	1	0	3
SOC 811	E	Cultural Competence in Health Care	2	1	0	3
SOC 813	E	Sociology of Bioethics	2	1	0	3
SOC 815	E	Global Health	2	1	0	3
S0C 817	E	Comparative Health Care Delivery System	2	1	0	3

SECOND SEMESTER

Compulsory Courses

Course Code	Status	Course Title	L	T	P	U
SOC 802	C	Sociological Methods	2	1	0	3
SOC 804	C	Computer Application in Statistical Analysis	1	1	1	3
SOC 806	C	Fundamentals of Population Health	2	1	0	3
SOC 808	C	Mental Health and Wellness	1	1	0	3
SOC 810	C	The Technology of Herbal Medicine	2	1	0	3
		Total Electives (2)				**6**
	Total					**15**

Elective Courses for both Medical Sociology and Population Health.

Course Code	Status	Course Title	L	T	P	U
SOC 812	E	Social Epidemiology	2	1	0	3
SOC	E	Health	2	1	0	3

814		Communication Technology				
SOC 816	E	Population and Development	2	1	0	3
SOC 818	E	Rural Sociology and Healthcare	2	1	0	3
SOC 820	E	Technology and Social Change	2	1	0	3

THIRD SEMESTER

Course Code	Status	Course Title	L	T	P	U
SOC 819	C	Seminar I	0	0	0	2
SOC 822	C	Seminar II	0	0	0	2
SOC 823	C	Master's Dissertation	0	0	0	12
	Total					**16**

COURSE DESCRIPTION

SOC 801: Sociological Theory (3 Units)
The historical development of sociology with the extensive discussion of the major proponents; Major theoretical classifications and relationships between them: Conflict; Functionalism; Symbolic interactionism and Social exchange theory. Intellectual influences on sociology founding fathers. Theoretical models as tools to solving fundamental institutional problems in the society.

SOC 802: Sociological Methods (3 Units)

Social science research- principles, methods and practice; science and scientific research; the research process; theories in social science research; Basics of empirical research- Research design, measurement of constructs, scale reliability and validity, sampling, data collection, survey research, experimental research, case study, interpretative research; Data analysis- quantitative analysis, qualitative analysis, descriptive statistics and inferential statistics.

SOC 803: Social and Behavioural Statistics (3 Units)
Descriptive and Inferential Statistical method; Frequency distributions; Central Tendency; Variability. Location of Scores and standardized distributions; probability and samples; the logic of hypothesis testing; using t- test as statistics for inferences about population; introduction to analysis of variance; correlation; chi square.

SOC 804: Computer Application in Statistical Analysis (3 Units)
The practical application of computers in data analysis would be presented with particular emphasis on Statistical Package for Social Sciences (SPSS), Epidemiological Information (Epi Info), Microsoft Excel and other data based programmes. Emphasis would also be placed on the use of computers in sampling designs and selection, sampling distribution and parameter estimation. Furthermore, the use of computers in hypothesis testing using correlation and regression analyses, chi- square, Stata, Factor analysis and other inferential statistical tools are presented and discussed.

SOC 805: Medical Sociology (3 Units)
This course focuses on Sociological concepts in the analysis of the course and distribution of illness, theories in medical sociology, health and medical orientation, pattern of utilization of health services; specialization in medical sociology, theories and concept of disease, analysis of provision and patronage of health and preventive services; medical profession and socialization of health professionals. Drug and equipment supply; Health policy defined; health policy in Nigeria; Health sector reform programmes and performance.

SOC 806: Fundamentals of Population Health (3 Units)
The focus of population health, General wellbeing and quality of life of the people will be discussed. Health determinants, health metrics, aging and health, child survival and population health issues. Public health issues, technology and population health. public health policy; mental health policy; insurance policy; politics in health policy; Human right to a healthy living and the Sustainable development goals; National Health Insurance Scheme (NHIS); politics in health policy.

SOC 807: Social Demography (3 Units)

Demography and Social Demography defined. Importance of Social Demography to society growth and development explained. Factors shaping population size, composition and density including topics like mortality, morbidity, fertility, migration, urbanisation, age and sex structures and the social implications of demographic changes. Demographic patterns and dividends in Africa with particular inference to Nigeria.

SOC 808: Mental Health and Wellness (3 Units)

The perspectives of mental health and wellness; importance of mental health and wellness; the holistic approach to mental health and wellness: family, school and work life. Components of mental wellness and illness; types of mental illness; Stress and wellbeing; societal stressors and control mechanisms; depression, rejection and prejudice. Behavioral outcome of mental disorder.

SOC 809: Sociology of Health and Illness Behaviour (3 Units)

Social construction of health and illness, Who defines a disease process? socioeconomic status as direct indices of health and illness condition; sociological pathology of disease and illness; effect of social behaviours on health; social definition of health; health and illness seeking behaviour; health behaviour and lifestyle determinants of health e.g. nutrition, physical activities/exercise, alcohols and drugs. Behaviour change models.

SOC 810: The Technology of Herbal Medicine (3 Units)

Introduction to herbal medicine, history of herbal medicine; Ancient Western World Traditional Medicine Systems; Evaluation of some African Medicinal Plants; Health benefits of herbal medicine; Cultural attitudes to traditional medicine; Standardization and regulation of herbal medicine; Contemporary issues on herbal medicine; Traditional medicine agenda for developing countries.

SOC 811: Cultural Competence in Health Care (3 Units)

Definition of key concepts including Cultural competence; Cultural humility; Cultural respect; and Culture and health literacy. Doctor and patients' communication patterns; Patients' preference and willingness to seek treatment; Individual and dyadic communication models; behavioural models to healthy life and health care as a tool to a healthy society.

SOC 812: Social Epidemiology (3 Units)

Definition of general Epidemiology; Branches of Epidemiology; Effects of social factors on individual and population health; Concepts of Bio-psychological paradigm; theories of diseases aetiology; social factors on the distribution, incidence and prevalence of morbidity, mortality, life expectancy, Disparities in Health access and outcome; Quality and life: Health education and Promotion.

SOC 813: Sociology of Bioethics (3 Units)

Bioethics and Sociology defined; historical antecedents of the rise of ethic in the biosciences curriculum, sensitivity to cultural nuance in ethical reasoning and decision making; the intersection of sociology and bioethics; advances argument for or against particular ethical issues, exploring the cultural, social, political and professional underpinnings of bioethical debates. Social science research is employed along philosophical treatise for objective explanation.

SOC 814: Health Communication Technology (3 Units)

Health communication defined; History and importance of health communication; Health communication channels; Health communication and health informatics; Culture influence on health communication; Attributes of effective health communication; Areas of health communication; Health education and advocacy; Levels of inquiry; Health communication as imperative of health promotion. Digital communication in disease treatment.

SOC 815: Global Health (3 Units)

The general outlook of health as described by the World Health Organization (WHO) parameters taking cognizance of the interplay between spiritual, emotional, social, psychological and mental as components of complete wellbeing; prevalence of non-communicable

diseases as a result of life style and environmental issues. Health and illness outcome of pollution and climate change. Infectious diseases as a global challenge e.g. HIV/AIDs, Ebola, Malaria, Tuberculosis.

SOC 816: Population and Development (3 Units)

The nature of population variables and its interaction with other socio-economic variables. The analysis of philosophy and method of planned development. The demographic background to development, planning, population growth, manpower and employment; population; rural and urban land use and migration; population and food production, population and health integration, family life and other services, population planning (family planning) and development.

SOC 817: Comparative Health Care Delivery System (3 Units)

The course deals with a variety of important themes in the field of medical sociology. Consideration will be given to themes such as organization of medical practice, professionals and bureaucracy, medicine and the state, organization of health services, health manpower, and comparative health delivery system.

SOC 818: Rural Sociology (3 Units)

The course deals with the sociological analysis of the rural social organization, the problems and prospects of rural development. Conceptual difficulty inherent in the concepts or rural and rurality. Various theoretical approaches in rural sociology and their relevance to rurality in Nigeria and Africa. Practical ways through which rural areas can be developed; the place of agricultural and rural development in national development and planning; strategies and models of rural development while emphasizing the processes of social, economic and political integration of rural areas into national society; and rural infrastructure and institutional development.

SOC 819: Seminar (2 units)

Seminar presentation in the area of Medical Sociology or Population Health studies. Students are expected to present a seminar paper in their area of specialization under a thorough guidance of an expertise supervisor.

SOC 820: Technology and Social Change (3 Units)

The concepts of technology and social change defined and fully explained. Technology as intertwined with societal growth and development; types of societies as typified by nature and extent of technology e.g. Pre-industrial, Industrial and post-industrial societies with their major characteristics; Theories of Social Change; Causes, effect and types of social change. Globalization and social change. Application of technology in contemporary times to the family e.g. fertility drugs, sex pre-selection, genetic engineering and biotechnology; Communication and education e.g. internet and online learning, media and television etc.; Agriculture and the likes; Digital revolution as aspect of social change.

SOC 822: Seminar II (2 units)

Seminar presentation in the area of Medical Sociology or Population Health studies. Students are expected to present a seminar paper in their area of specialization.

SOC 823: Master's Dissertation (12 Units)

A master's dissertation that is novel and empirical must be undertaken by the student in a relate topics to their course of study supervised by an expert. The dissertation will be defended in a specialist area at an oral examination organized by the School of Postgraduate Studies.

MASTER OF PHILOSPHY (M. PHIL) AND M. PHIL/Ph.D. PROGRAMME IN MEDICAL SOCIOLOGY AND POPULATION HEALTH

M.PHIL (MASTER OF PHILOSOPHY)/ M.PHIL. Ph.D

1. **Programme offered**: Master of Philosophy (M.Phil.) in the following options:
   i. Medical Sociology
   ii. Population Health

2. PROGRAMME PHILOSOPHY

Degrees leading to an award in Master of Philosophy (M.Phil.) or M.Phil./Ph.D in Medical Sociology or Population Health are advancements studies building on the understanding of the key ideas of the earlier courses

on Sociological theories. These studies are necessary in order to attain an appreciative in-depth knowledge of both classical and contemporary theories needed for proper research methods on the intersection of social behaviour, cultural patterns and health issues in the society. It is an 18-months programme that is technologically driven through blended learning methods and includes a series of seminar-based and research-oriented courses. Students will have the opportunity for specialization and career development through a thorough engagement in critical research methodology leading to the award of the degree in either M. Phil Sociology or Population Health depending on the student's area of expertise. Beyond career development and progress, the award also offers successful students the opportunity for doctoral work in their area of specialization if they perform excellently well.

3. PROGRAMME OBJETIVES

The programme is principally intended to:

1. Give career development opportunities to qualified students in the specialized areas;
2. Acquit students with adequate proficiency through critical thinking skills and further their research acumen;
3. Avail opportunities to students who may want to further their career chances to doctoral level.

4. JUSTIFICATION FOR THE PROGRAMMES

M. Phil. or M. Phil/Ph.D. Sociology or Population Health option is designed to avail students the opportunity to further their research proficiency in their specialized area through dogged and resilient learning. It is envisioned to build rigorous research skills through a blended learning curriculum that is useful in today's technological driven world and enable successful students proceed to the Doctor of Philosophy (Ph. D).

5. ADMISSION REQUIREMENTS

i. Candidates should be holders of Masters' degree in Sociology (M.Sc.) or M. Tech Medical Sociology/ Population Health Studies from INTEDH, FUTA or other recognised universities.
ii. M. Phil candidates must have scored a minimum of 50% and 54.9% or 2.4 and 2.99 on a 5-point grade at the Master's Degree programme
iii. Candidates deficient in some areas shall be asked to audit some courses as applicable.
iv. All application for admission shall be subject to Postgraduate Schools regulations and carrying capacity.

6. DURATION OF PROGRAMME

a. M. Phil Programme
The Master of Philosophy Programme shall be a Full-Time programme of minimum of eighteen (18) months.

b. M. Phil/Ph.D Programme
The duration for M. Phil/Ph.D programme shall be for a minimum of 12 months to maximum of 18 months. Candidates, who at the expiration of 18 months cannot meet up with the requirements for conversion to Ph.D, shall terminate the programme at the M. Phil level.

***Both programmes are full-time and there shall be oral examination for both

M.Phil. and M.Phil/ Ph.D.

7. REQUIREMENTS FOR GRADUATION

a. M. Phil Programme

To be qualified for the award of the Master of Philosophy degree in Sociology or Population Health option, candidates must have fulfilled the following:

i. Passed a total of 24 units course in two semesters which include 6 units of research projects;
ii. Passed all course works prescribed by the institute with a minimum score of 50% in each course;
iii. Successfully presented at least two seminars (proposal and progress);
iv. Successfully completed and defended the research thesis at an oral examination as recommended and approved by the Board of Studies of Postgraduate School
v. To qualify and proceed to Ph.D. candidates must have scored an average of 60% or a minimum of 3.50 and above on a s point grading system

b. M. Phil/Ph.D

Candidates of M.Phil./Ph.D. are expected to have passed a total of **twelve (12) Course Units** as below:

i. Advanced Social Research Methods (C) in first semester (3 units).
ii. Advanced Social and Behavioural Statistics (C) in the second semester (3 units).
iii. Candidates must have attained 50% in each of the courses offered, and passed the oral examination on the project proposal before the panel of examiners (6 units).
iv. The course work examination shall be graded 60% and the research proposal shall be

graded 40%. To proceed, candidate must score an average of 60% or 3.50 on a 5 point grading system and above.

REQUIREMENTS FOR CONVERSION FROM M.PHIL, M.PHIL/ PhD to Ph.D. PROGRAMME

A candidate who wants to convert from either of the above programme to full Ph.D must satisfy the following conditions:

i. Have successfully presented at least two seminars: proposal and progress seminars.
ii. Prepare and submits to the Postgraduate School through the institute, a research plan considered suitable for his/her pursuit of a Ph.D. Degree
iii. Candidates must have completed all course work with CGPA of not less than 3.5 or 60% aggregate score in the M. Phil, M. Phil/Ph.D. programme.
iv. Must have passed an oral transfer examination to be conducted by the panel consisting of members from the institute on the specialised area of such research work.
v. Candidates must have complied to all other standards given by the University Senate including obtaining and completing the Ph.D. Conversion Form as appropriate.

8. COURSES

M. PHIL & M. Phil/Ph.D
First Semester

Course Code	Status	Course Title	L	T	P	Units
		COMPULSORY COURSES				
SOC 901	C	Advanced Sociological Theory	2	1	0	3
SOC 903	C	Advanced Social Research Methods	2	1	0	3
		ELECTIVES				
SOC 905		Culture, Gender and Health	2	1	0	3
SOC 907		Social Epidemiology	2	1	0	3
TOTAL		2 compulsory and 1 elective				9

M. PHIL Second Semester

Course Code	Status	Course Title	L	T	P	Units
SOC 902		and Behavioural Statistics				
SOC 904	C	Population Health and Development	2	1	0	3
		ELECTIVES				
SOC 906	E	Global Mental Health	2	1	0	3
SOC 908	E	Sedentary Behaviour in Human Health and Disease	2	1	0	3
TOTAL		2 compulsory and 1 elective				9

THIRD SEMESTER

SOC 999	C	Project	0	0	0	6

9. COURSE SYNOPSIS

SOC 901: Advanced Sociological Theory
3 units

Macro and Micro level theories in the light of classical and new sociological themes. Theory and the value of modern classics: George, Goffman, Erving etc. post-modern thoughts and new developments of Sociology in the changing world. Sociological theories as framework in explanation to reality: the traditional versus the modern

SOC 902: Advanced Social and Behavioural Statistics 3 units

The course addresses core statistical concepts and methods necessary to conduct social science research. Descriptive statistics, T-test and ANOVA, Contingency table analysis and correlations. Logistic regression analysis, time series, count models including Poisson regression, negative binomial regression etc. practical application of statistical software package stata.

SOC 903: Advanced Social Research Methods 3 units

This course is designed as an advanced course in sociological research methods that will culminate into a complete research paper that will incorporate theory, review of literature, data analysis and research findings.

SOC 904: Population Health and Development 3 units

Demographic perspectives and theories; Demographic transition; Mortality, health and development; fertility, determinants and patterns; fertility problems in Nigeria; Migration, theories and trends, changing population age structures. Demography and the nation's development.

SOC 905: Culture, Gender and Health
3 units

The concept of culture, gender and health; Cultural norms as significant determinant of gender biased practices that impairs health; difference in biological and social definition of gender and sex; the intersection of gender with other drivers of inequalities, discrimination, marginalization and social exclusion. Harmful Traditional Practices (HTPs) and Fundamental Human Right of women.

SOC 906: Global Mental Health
3 units

Description of Mental Health: concept and global challenge. Social determinants of mental health; Cultural differences in presentation of mental illness; mental health issues among adolescents, youths and adults; Stigmatization: causes and reduction strategies.

SOC 907: Social Epidemiology 3 units

Social epidemiology defined and expatiated, a proper study of the history of social epidemiology, theoretical frameworks used in explanation of social epidemiology, investigation of the relations between social factors and health as well as health disparities.

SOC 908: Sedentary Behaviour in Human Health and Disease 3 units

Sedentary behaviour defined and explained causes and effects which may include premature mortality, cardiovascular diseases, type 2 diabetes, depression, as well as overweight and obesity etc. effective remedy to sedentary diseases e.g. physical activities and exercises.

Ph.D. PROGRAMMES IN MEDICAL SOCIOLOGY AND POPULATION HEALTH

1. POSTGRADUATE PROGRAMME OPTIONS

The programme offers Ph.D. courses as specified below:

A. Doctor of Philosophy in:
   i. Medical Sociology
   ii. Population Health

2. PROGRAMME PHILOSOPHY

The Institute of Technology-Enhanced Learning and Digital Humanities (INTEDH) is unswerving in its determination at providing a technologically enriched training to students as a response to the dynamic nature of the current world. In line with the main objective of INTEDH, Ph.D. in Medical Sociology or Population Health, is an academic programme that intends to use sociological perspectives through blended learning skills to teach students the interaction between health and society which will allow students/learners engage with the social and cultural framing of what is defined as illness or diseases. This knowledge when acquired is aimed at providing basic explanation that will lead to a healthy population when applied. The rudimentary tenet of this academic pursuit is to bring to fore the importance and intricacies of social behaviour and environment on the health condition of people. The programme will connect theoretical fundamentals and critical analysis to applied technological output in the area of herbal and traditional medicine, lifestyle and health outcome, as well as effects of social structure and institutions on health and well-being.

3. PROGRAMME OBJECTIVES

The specific objectives of the programme include:

a. Career development and enhancement that is technologically enthused in the area of medical sociology and population health to researchers who are in related fields and needs conceptual and theoretical explanation and understanding to improve their expertise.
b. A full technologically compliant hybrid learning approach to the understanding of major conceptual intricacies of health and illness as derivatives of both biological and social factors.
c. Training on the necessity of marriage of convenience between herbal medicine technology and orthodox medicine.
d. The programme will give opportunity to medical professionals and health officers who wish to improve on their expertise in a renewed technological driven career development.
e. The curriculum stresses both qualitative and quantitative methodology, data collection,

statistical analysis and comparative and historical research to bring out objectively the social context of health, illness and healthcare.

4. PROGRAMME JUSTIFICATION

The Ph.D. programme in options of Medical Sociology or Population Health is directed at candidates and individuals who are passionate at making a vast impact in their community's health through a thorough understanding of its cultural, social and psychological influencers. It will lead to producing quality leaders in education, research, public health as well as other imperative empirically proven fields. The curriculum is technologically packaged to meet the demands of today's world of blended learning opportunities which is interactive enough to bring the positive change required for better healthy living outcome especially in the African setting.

5. ADMISSION REQUIREMENTS

A. Ph.D. degree in Medical Sociology

i. A Master's degree in Sociology or related course from recognised institutions with a minimum score of 60% in the thesis as well as in the overall result or CGPA of 3.5 on a 5point scale.

ii. M. Phil.\M. Phil. Ph.D. in Sociology, Medical Sociology or Population Health options from INTEDH, FUTA, Akure or other recognized and reputable universities with a CGPA of not less than 3.5 on a 5-point scale credit or a minimum overall score of 60%

B. Ph.D. degree in Population Health

a. A Master's degree in Demography, Health/Social Statistics, Sociology or related course from recognised institutions with a minimum score of 60% in the thesis as well as in the overall result or CGPA of 3.5 on a 5point scale.

b. M. Phil.\M. Phil. Ph.D. in Sociology, Medical Sociology or Population Health options from INTEDH, FUTA, Akure or other recognized and reputable universities with a CGPA of not less than 3.5 on a 5-point scale credit or a minimum overall score of 60%

6. PROGRAMME DURATION

The duration of the programme shall be as follows:

i. Full-time: 36-48 months

ii. Part-time: 48-60 months

7. GRADUATION REQUIREMENTS

A. Doctor of Philosophy (Ph.D) Programme

a. Ph.D. in Medical Sociology

b. Ph.D. in Population Health

A candidate earns the Ph.D degree in either of the above after s/he has successfully:

i. completed any prescribed course work.

ii. presented four Departmental Research Project Seminars.

iii. defended the research thesis in a specialist area at an oral examination organised by the School of Postgraduate Studies.

POSTGRADUATE DIPLOMA PROGRAMMES (PGD) IN ENGLISH FOR SPECIFIC PURPOSES

1. PROGRAMME OFFERED

(a) Postgraduate Diploma in English for Specific Purposes

2. PROGRAMME PHILOSOPHY

The Institute of Technology-Enhanced Learning and Digital Humanities (INTEDH) is committed to a higher education environment that fosters transformative and reflexive practices in learning and teaching; it strives to create a socially responsive and contextually relevant teaching and learning environment. The focus areas include: staff development, course and curriculum design and re-design, and educational technology integration.

3. PROGRAMME OBJECTIVES

The objectives of the programme include: training and re-training of specialist English Language teachers and Communication experts who will be able to plan and design ESP programmes for specific learners and prepare appropriate teaching/learning materials for use by specific learners in special contexts. It also includes re-orientating English language training and enriching the linguistic environment and repertoire of English language practitioners in Nigeria in line with those of their counterparts in other parts of the world.

The objectives of the programme are to:

a) train students who will be able to evaluate and select ESP teaching materials, methods and be able to conduct ESP course evaluation,
b) demonstrate the necessary professional skills and academic competence that will help them contribute to the study of ESP as a discipline,
c) train students who will be skilled to function as curriculum designers, test designers, programme managers, instructional technology specialists who will work in educational institutions, organisations, NGOs, media houses, government establishments and contexts where English is used as a second language, particularly, African countries.

4. PROGRAMME JUSTIFICATION

The Diploma in ESP programme, which has the objective of training specialist English Language teachers and Communication experts, is unique in the following ways:

a. It promotes research in English for Specific Purposes,
b. It repositions the teaching and research of English language in Nigerian Universities,
c. Provides specialist training for new teachers who wish to develop a career in English language teaching.
d. Provides capacity for the development of twenty-first century work skills, and is taught through a blended learning mode which combines face-to-face classroom interaction and deployment of learning technologies, and is enriched with a strong emphasis on the acquisition of 21st century skills.

5. ADMISSION REQUIREMENTS

i. Candidates are required to possess a good first degree not less than a Third Class in English, Linguistics, Communication and Language Arts, Mass Communication, Education, English Language Teaching or related courses,
ii. Credit in Higher National Diploma in related courses such as Mass Communication.

6. PROGRAMME DURATION

The PGD programme is a full-time programme of eighteen (18) months of three semester duration.

7. GRADUATION REQUIREMENTS

To qualify for the award of a Postgraduate Diploma in English for Specific Purposes, a candidate must have:

i. passed a minimum TLU of 40 units, including 6 units of Research Project and 30 units of compulsory or core course and 4 units of elective courses.
ii. successfully defended the Research Project in the specialist area at a project defence organised by the School of Postgraduate Studies

8. COURSE OUTLINE

A. POSTGRADUATE DIPLOMA IN ENGLISH FOR SPECIFIC PURPOSES

First Semester

COURSE CODE	COURSE TITLE	Course Status	L	T	P	U
ESP 701	Introduction to Grammatical Theories and Structure of English	C	3	0	0	3
ESP 703	Fundamentals of Discourse Analysis and Pragmatics	C	2	0	0	2
ESP 705	Introduction to ESP	C	3	0	0	3
ESP 707	Writing Skills	C	1	0	3	2
ESP 709	Theory and Practice of Second Language Learning	C	3	0	0	3
	ELECTIVE COURSES	E	4	0	0	4
	Total					**17**

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

COURSE CODE	COURSE TITLE	Course Status	L	T	P	U
ESP 711	Basics of Stylistics	E	2	0	0	2
ESP 713	Introduction to Semantics	E	2	0	0	2
COM 713	Introduction to Technical Writing and Editing	E	2	0	0	2

REQUIRED COURSE

Students are expected to take this required course

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 705	Facilitating Online	Audited	0	0	3	1

Second Semester

CORE COURSES

Course Code	Course Title	Course Status	L	T	P	U
ESP 702	ESP/ELT Methodology	C	3	0	0	3
ESP 704	Course and Syllabus Design	C	2	0	0	2
ESP 706	Materials Analysis and Production	C	2	0	0	2
ESP 708	Research Methods in ESP/ELT	C	3	0	0	3
ESP 710	Seminar in ESP/ELT	C	3	0	0	3
	ELECTIVE COURSES	E	4	0	0	4
	Total					**17**

ELECTIVE COURSES

Students are expected to take at least 2 units of elective courses from this list

Course Code	Course Title	Course Status	L	T	P	U
ESP 712	Technology Assisted Teaching and Learning	C	2	0	0	2
ESP 714	English in Nigeria and the National Language Question	E	2	0	0	2
SOC712	Introduction to Technology and Social Change	E	1	1	0	2
COM 727	Fundamentals of Data Communication	E	2	0	0	2
	Total					8

Third Semester

Course Code	Course Status	Course Title	L	T	P	U
ESP 799	C	Postgraduate Diploma Project	0	0	18	6
Total						**6**

9. COURSE SYNOPSES

ESP 701: Introduction to Grammatical Theories and Structure of English (3 Units)
This course is an introduction to grammatical theories and models of grammatical analysis, and it offers training in traditional, structural, transformational, generative and systemic grammar. It also covers basic morphological processes and discussions on the functions and structure of noun and adverb phrases etc.

ESP 702: ESP/ELT Methodology (3 Units)
The course offers instruction in the rudiments of ESP/ELT teaching and learning, and provides introduction to language learning theories, with special attention to language theories that are relevant for ESP/ELT. Principles and techniques that underlie good classroom teaching and learning, activity and task design are highlighted and key concepts in ESP/ELT course content: learner needs, needs analysis, tasks, activities etc explored. The course focuses on the understanding of the processes of language learning, and learner-centered approach to teaching/learning, and draw from students' specialist areas, authentic purpose derived from students' needs. A main feature of the ESP/ELT methodology course is the use of tasks and activities reflecting the students' specialist areas.

ESP 703: Fundamentals of Discourse Analysis and Pragmatics (2 Units)
This course explores the concepts of text and discourse and how different approaches to analysing texts and discourse can be used in a second language teaching and learning context. There will also be focus on the role of contexts in the analysis of discourse, cohesion and coherence, speech acts, schema theory, conversation analysis and its implications for language teaching and learning in the digital age.

ESP 704: Course and Syllabus Design (2 Units)
The students are introduced to the fundamental concepts of course and syllabus design, the status of ESP syllabuses, the context of course and syllabus design, needs analysis, language testing, communicative and specific purposes of language testing, and statistical techniques in ESP language testing.

ESP 705: Introduction to ESP (3 Units)
Introduction to ESP offers a learner-centred approach to teaching English and focuses on developing communicative competence in specific disciples. The course explores the key concepts and developments in ESP theory and practice, and looks at the teaching of a variety of branches of ESP such as English for Academic Purposes (EAP) and English for Occupational Purposes (EOP), English for Science and Technology (EST) etc.

ESP 706: Materials Analysis and Production (2 Units)
This course focuses on the general principles of materials production, analysis of ESP course books and e-texts, procedures for materials production, procedures for the evaluation, and adoption of existing materials.

ESP 707: Writing Skills (2 Units)
The students offering the course are introduced to the general principles guiding effective communication, writing features, writing science popularization, writing reports, writing minutes of meeting, writing for the media etc. Fundamental elements of punctuation, aspects of grammar, specialized writing, and basic news writing will be considered.

ESP 708: Research Methods in ESP/ELT (2 Units)
This course presents the basic concepts in applied linguistic research including the various types of research: field work; use of library resources and archives; experimental, descriptive, analytical and statistical methods. Ethical considerations in applied linguistic research will be highlighted.

ESP 709: Theory and Practice of Second Language Learning (3 Units)
The course provides participants with an overview of second language pedagogy. Principles relating to

classroom procedures, activities, techniques and relevant pedagogic models for teaching language skills will be presented. On completion of the course, participants will be able to critically evaluate approaches and methods of teaching second language, and conduct key research relating to second language acquisition. Students should also be able to determine and evaluate appropriate methodology to employ using the needs of learners as a guide.

ESP 710: **Seminar in ESP/ELT (2 Units)**
Seminar presentation on an approved topic in the area of ESP/ELT. The candidate will make substantial contribution to knowledge in general and the profession in particular in this Research Project.

ESP 711: Basics of Stylistics (2 Units)
The focus of this course is on the study of the variations in language; register, degrees of formality, situational appropriateness; rules, role perception and role play. The course focuses on the study of style in texts and literary works, and on rhetorical devices that provide variety and distinctiveness to writing.

ESP 712: Technology Assisted Teaching and Learning (2 Units)
This course provides the opportunity to engage in the design of language learning materials using online technologies. It builds on understanding of language learning methodologies as well as syllabus design. Course materials, tutor feedback, assessment and evaluation are all areas where developments in ICT provide new possibilities for distance education, blended learning and supplementary course notes/exercises. This course explores language learning specific to these areas and course participants will be able to design and evaluate their own language learning materials.

ESP 713: Introduction to Semantics (2 Units)
The course introduces students to the notions of reference, connotation, neologism, semantic field, synonym etc. applied to English including lexical variation in various forms of English; the notion of semiology; meaning change. The course also explores the application of semantics to everyday interactions and literary communication, and the connection between semantics and logic.

ESP 714: English in Nigeria and the National Language Question (2 Units)
A brief historical review of English in Nigeria; an analysis of the English of students; error analysis; a study of the notion of inter-language and fossilization, varieties of English in Nigeria; and introduction to the study of pidgin in Nigeria; its phonology, morphology, syntax and semantics; language planning policies in multilingual nations, practical problems of the implementation of the national planning policies on language and education in Nigeria.

ESP 799: Postgraduate Diploma Project (6 Units)
This will be an original investigation in an area of ESP/ELT, the title of which shall be approved by the School of Postgraduate Studies, and the project will make an original contribution to knowledge.

MASTER'S PROGRAMMES IN TEACHING ENGLISH FOR SPECIFIC PURPOSES

1. POST GRADUATE PROGRAMME OPTIONS

This Programme offers a Postgraduate Master's course as specified below:

B. Master of Science in: Teaching English for Specific Purposes (MSc TESP)

2. PROGRAMME PHILOSOPHY

The Institute of Technology-Enhanced Learning and Digital Humanities (INTEDH) is committed to a higher education environment that fosters transformative and reflexive practices in learning and teaching; it strives to create socially responsive and contextually relevant learning and teaching environments supported by technology. The course, Teaching English for Specific Purposes (TESP), has the following key focus areas: course and curriculum design and re-design with technology and educational technology integration. The course incorporates diverse areas such as: English for Academic Purposes (EAP), English for Science and

Technology (EST), English for Medical Purposes (EMP), English for Occupational Purposes (EOP) etc. The programme is both theoretical and applied, and covers general Linguistics i.e. Grammar, Stylistics and Discourse Analysis etc. The ESP module focuses on important areas such as: needs analysis, teaching language for specific purposes, issues in ESP syllabus design, ESP course evaluation and teaching of English in special contexts such as Business, Medicine, Law etc. The course, which is underpinned by relevant theories, introduces students to a learner-centered approach to language study, is taught through a blended learning mode, and enriched with a strong emphasis on 21st century skills.

3. PROGRAMME OBJECTIVES

The specific objectives of the programme include the training of specialist English Language teachers and Communication experts who will be capable of integrating technology in language teaching, promote research in ESP, re-orientate English language training in Nigerian Higher Education Institutions (HEIs), and enrich the linguistic environment and repertoire of English language practitioners in applying digital technology as work and research tools. The course provides students a theoretical grounding in language teaching, practice and theory of ESP while incorporating the different strands of ESP such as: English for Occupational Purposes (EOP) and English for Educational or Academic Purposes (EAP). The course will offer opportunities to up skill teachers to develop career in English language teaching and integration of technology.

SPECIFIC OBJECTIVES

Upon graduation, graduates who specialise in English for Specific Purposes will

a. conduct needs analysis of specific groups of learners;
b. be able to evaluate and select ESP teaching materials, methods and be able to conduct course evaluation;
c. create original ESP teaching materials;
d. be equipped with the necessary professional skills and academic competence leading to the study of ESP as a discipline;
e. recommend methods of assessment and testing appropriate for specific ESP contexts
f. make connections between the relevant findings from discourse analysis, in particular from genre analysis and the teaching of ESP discourse skills;

4. PROGRAMME JUSTIFICATION

The MSc. programme in Teaching English for Specific Purposes are targeted at professionals who are trained as curriculum designers, test designers, programme managers, instructional technology specialists with competency to apply digital technologies, and who will work in educational institutions, organisations, NGOs, media houses, government establishments and contexts where English is used as a second language, particularly, African countries. Upon graduation, products who specialize in English for Specific Purposes will be able to plan and design ESP programmes for specific learners and prepare appropriate teaching/learning materials for use by specific learners in special contexts, and will be able to apply technology in the contemporary workplace. Courses are taught through a blended learning mode with deployment of appropriate technologies that suit students' learning environment and context while at the same time making room for learner-teacher, learner-learner and learner-content interaction.

5. ADMISSION REQUIREMENTS

A. Master's degree in Teaching English for Specific Purposes

Academic requirements for the Master's degree in Teaching English for Specific Purposes include:

a. Holders of a good first degree in English Language, English Language Teaching, Linguistics, Communication and Language Arts or related disciplines with at least Second Class (Lower) from any Senate recognized University.
b. A good first degree with a minimum of Second Class (Lower) in a related discipline such as: English Language, English Language Teaching, Linguistics, Communication and Language Arts obtained from a recognised university plus a Postgraduate Diploma in ESP, Technical Communication, Development Communication or Digital Literacy of FUTA or other recognised university.

6. PROGRAMME DURATION

The duration of the programme shall be as follows:

A. Master's degree:

a. Full-time: 18-24 months
b. Part-time: 24-36 months

7. GRADUATION REQUIREMENTS

A. Master's Programme

To be qualified for a Master's degree in TESP, a candidate must have:

a. completed a course of 18-24 months duration of three or four semesters for full-time study and 24-36 months duration of four to six semesters for part-time study
b. passed a minimum TLU of 40, including 12 units of research project and 28 units of compulsory or core courses;
c. successfully presented three(3) Departmental Research Project seminars
d. successfully defended the Research Project in the specialist area at an oral examination organised by the School of Postgraduate Studies.

MASTER'S PROGRAMME IN TEACHING ENGLISH FOR SPECIFIC PURPOSES

8. COURSE OUTLINE

FIRST SEMESTER

COMPULSORY COURSES

COURSE CODE	COURSE TITLE	STATUS	L	T	P	Units
ESP 801	Grammatical Theories and Structure of English	C	2	0	0	2
ESP 803	Discourse Analysis and Pragmatics	C	2	0	0	2
ESP 805	Introduction to ESP	C	3	0	0	3
ESP 807	Seminar in English Language Teaching	C	3	0	0	3
COM 801	Research Methodology and Academic Ethics	C	3	0	0	3
	ELECTIVE	E	2	0	0	2
	Total					**15**

Students are expected to take at least one elective course

ELECTIVE COURSES

COURSE CODE	COURSE TITLE	L	T	P	U
ESP 809	Advanced Writing Skills and Document Design	1	0	3	2
ESP 811	Advanced Stylistics	1	0	3	2
ESP 813	Advanced Semantics	2	0	0	2
ESP 815	The Sociology of Science Knowledge	2	0	0	2
ESP 817	Advanced Media Reporting	2	0	0	2

AUDITED COURSE: Only for candidates who have not taken it previously

COURSE CODE	COURSE TITLE	STATUS	L	T	P	U
COM 705	Facilitating Online	Audited	0	0	3	1

SECOND SEMESTER

COURSE CODE	COURSE TITLE	STATUS	L	T	P	Units
ESP 802	Course and Syllabus Design	C	2	0	0	2
ESP 804	Materials Analysis and Production	C	2	0	0	2
ESP 806	Research Methods in ESP	C	2	0	0	2
ESP 808	Technology Assisted Teaching and Learning	C	1	0	3	2
ESP 810	Special Topics in ESP (Seminar)	C	3	0	0	3
	ELECTIVE	E	2	0	0	2
	Total					13

Students are expected to take at least one elective course

ELECTIVE COURSE

COURSE CODE	COURSE TITLE	L	T	P	Units
ESP 812	English in Nigeria and the National Language Question	2	0	0	2
ESP 814	Advanced Scientific Communication	1	0	3	2
ESP 816	Corpus Linguistics	1	0	3	2
ESP 818	Linguistic Varieties	2	0	0	2

THIRD SEMESTER

COURSE CODE	COURSE TITLE	STATUS	L	T	P	Units
ESP 899	Research Project	C	0	0	36	12
	Total					12

9. COURSE SYNOPSES

ESP 801: Grammatical Theories and Structure of English (2 Units)

The course presents a comprehensive review of grammatical theories and models of grammatical analysis; a brief review of morphology; a detailed study of the functions and structure of noun and adverb phrases etc; prescriptive versus descriptive grammar, sentence constituents and the principles of constituent analysis, semantic aspects of transitivity etc. It explores various linguistic theories and their practical applications in understanding the structure of English, enabling students to develop a solid foundation in English grammar.

ESP 802: Course and Syllabus Design (2 Units)

The course explores the principles, strategies, and best practices in course and syllabus design, catering to diverse educational settings and learner profiles. It considers the following: fundamental concepts of course and syllabus design, the status of ESP syllabuses, the context of course and syllabus design, needs analysis, introduction to language testing, communicative and specific purposes of language testing and statistical techniques in ESP Language Testing. The course also provides opportunity for hands-on experience in crafting meaningful learning experiences while adhering to principles of pedagogic and instructional design.

ESP 803: Discourse Analysis and Pragmatics (2 Units)

This course explores the concepts of text, discourse and pragmatics and how different approaches to analysing texts and discourse can be used in a second language teaching and learning context. The course which considers language use in context, explores the fundamental principles and practical applications of discourse analysis and pragmatics, emphasizing their significance in understanding the complexities of communication. It considers how language functions within different social and cultural contexts, enabling students to become more effective communicators and analysts of discourse. The course focuses on different approaches to analysing language such as Conversation Analysis, Corpus Linguistics, Critical Discourse Analysis, Genre Analysis, Register and Style, Speech Act Theory, Cooperative Principle and Politeness Principle.

ESP 804: Materials Analysis and Production (2 Units)

This course covers the knowledge and skills for evaluating, adapting and designing language teaching materials. It trains students to adapt and supplement published materials in various ways and design their own materials for various teaching contexts. It also examines ways of involving learners in materials' evaluation and design.

ESP 805: Introduction to ESP (3 Units)

The course provides participants with a foundational understanding of the principles and practices of ESP within a learner-centered approach to teaching English. It focuses on developing communicative competence in specific disciples. It builds on the knowledge and experience students have acquired in Applied Linguistics and ELT, and investigates a specific area of language pedagogy in providing a comprehensive understanding of ESP which students can use in future language teaching. Also, it offers insights into the unique language needs and communication strategies required for various specialized fields such as business, healthcare, academics, engineering, and more.

ESP 806: Research Methods in ESP (2 Units)

This course expatiates the concept of hypothesis, need for objectivity; consideration of conflicting possibilities and theories. Types of research; use of library recourses and archives; experimental, descriptive, analytical and statistical methods; research design. The concept of methodology in ELT, research communication and academic report writing.

ESP 807 : Seminar in English Language Teaching (3 Units)

This is an independent Research Project that makes substantial contribution to knowledge in general and the profession in particular. The course entails a formal

research proposal formulation, presentation and defence at a Departmental Seminar.

ESP 808: Technology-Assisted Teaching and Learning (2 Units)
This course explores how digital tools and affordances allow for new models of teaching and learning which involve a critical review of how technology is used, and it explores current trends in educational settings. It also explores relevant theories of cognition, issues of access and equity, and considers how curriculum, instruction, and assessment can be designed with the support of technology. This course explores a range of digital tools, strategies, and best practices for enhancing teaching and learning experiences in various educational settings, and offers students practical insights into integrating technology effectively to foster engagement, improve learning outcomes, and adapt to the ever-evolving landscape of education.

ESP 809: Advanced Writing Skills and Document Design (2 Units)
The course focuses on the principles guiding effective communication in all contexts. Workshops on writing features, writing science popularization, writing reports, writing minutes of meeting, writing for the media, tele-drama, radio drama and documentation are the main features of the course. Other aspects to be considered include: stylistic and other linguistic devices appropriate for writing scholarly materials such as articles for learned journals, dissertations and doctoral theses, advanced writing techniques, principles of document design, and the integration of visual elements to produce polished and impactful written materials.

ESP 810: Special Topics in ESP (Seminar) (3 Units)
Students explore and investigate areas in ESP especially as these relate to their different areas of study interests such as, English for Academic Purposes (EAP), English for Science and Technology (EST), English for Medical Purposes (EMP), English for Occupational Purposes (EOP), English in special contexts such as Business, Medicine, Law etc. The course allows for independent study and research based on prescribed readings and other assignments and periodic consultations with lecturers on an approved aspect in ESP.

ESP 811: Advanced Stylistics (2 Units)
The Advanced Stylistics course delves into the intricate aspects of language and communication, offering an in-depth exploration of linguistic and literary stylistic devices. The course is designed to utilize the resources of the principles of linguistics in the analysis of texts. It deals with specific forms of writing and the application of grammatical model to prose, poetry and drama in English. The focus of the course is on the study of the variations within a language; register, degrees of formality, situational appropriateness; rules, role perception and role play. Participants will gain a comprehensive understanding of how style influences and shapes written and spoken discourse, and empowers learners to critically analyze and apply advanced stylistic techniques for a deeper appreciation and improved utilization of language in various contexts.

ESP 812: English in Nigeria and the National Language Question (2 Units)
The course provides a comprehensive study of the English Language in Nigeria. It provides an introduction into the nature of Nigerian English. It describes the features of Nigerian English and its classifications; identifies the different regional dialects of Nigerian English; explores the relationship between English, Nigerian languages, Pidgin English and Creoles; it identifies the functions and the status of English language in Nigeria, and investigates the problems of interference and intelligibility in a second language and the English language and the national language question in Nigeria. Finally, the course considers the sociological factors that influence language use, language variation, language attitude, language planning policies in multilingual nations, practical problems of the implementation of the national planning policies on language and education in Nigeria.

ESP 813: Advanced Semantics (2 Units)
The Advanced Semantics course delves into the intricate world of linguistic meaning, offering a deep exploration of the principles and theories that underlie the study of language semantics. This course focuses on semantic theories, explores the basic concepts and methods in the analysis of natural language meaning through a survey of major current approaches and their findings; focuses on structuralist semantics, cognitive semantics. The course extends the application of semantics to everyday interactions and literary communication, and the nexus between semantics and logic. Participants will develop an advanced understanding of how meaning is conveyed in language and the role of context, pragmatics, and linguistic structures in shaping interpretations. The course empowers learners to critically analyze complex semantic phenomena and apply advanced semantic theories to real-world language data.

ESP 814: Advanced Scientific Communication (2 Units)
The Advanced Scientific Communication course is designed to empower scientists, researchers, and academics with the skills and strategies needed to communicate their scientific work effectively to diverse audiences. This course focuses on advanced techniques for conveying complex ideas, fostering collaboration, and reaching a wider audience. Participants will gain expertise in producing scientific documents and presentations that are clear, persuasive, and engaging. The course considers rhetorical features of scientific writing, definition of concepts and objects, formal and non-formal expanded definitions, grammatical features of classifications etc, and also focuses on writing laboratory reports, technical vs non-technical writing, research projects and experimental research report etc.

ESP 815: The Sociology of Science Knowledge (2 Units)
The Sociology of Science Knowledge is an advanced course that explores the social and cultural dimensions of scientific knowledge production, dissemination, and reception. The course offers a deep examination of how scientific knowledge is constructed, validated, and understood within diverse social contexts. This course equips students to be able to construct scientific knowledge as well as investigate the nexus between science popularization, social policy, and the humanities. The following will be considered: definitions and approaches in science; scientific thought inside the science laboratory (social issues); literary and social forms in early modern service writing as a social practice and the construction of scientific knowledge and investigation of the complex interplay between scientific facts, social norms, power structures, and cultural influences.

ESP 816: Corpus Linguistics (2 Units)
The Corpus Linguistics course is an advanced exploration of the principles, techniques, and applications of corpus linguistics. This course introduces students to major ideas in the field of corpus linguistics, and equips them to be able to investigate and describe aspects of the structure of English as represented in corpus data. The course exposes students to basic statistical skills appropriate for linguistic analysis as well as the basics of good research design. The emphasis is on data collection and analysis, descriptive adequacy, argumentation, and written/oral presentation skills. Students are expected to be able to compare, contrast, and relate theoretical and empirical approaches to language study after taking this course, and they will be trained to harness the power of corpora to investigate language use, analyze linguistic patterns, and gain insights into various aspects of language, from syntax and semantics to sociolinguistics and discourse analysis.

ESP 817: Advanced Media Reporting (2 Units)
The Advanced Media Reporting course is designed to provide a comprehensive understanding of media reporting techniques in a rapidly evolving digital landscape. This course focuses on English in the media, the News as a media genre, principles for the selection of News items, General principles of Reporting, interviewing skills/Techniques, Translation and interpreting, common bad listening habits and their causes. Participants will explore advanced journalistic principles, data-driven reporting, multimedia storytelling, and the impact of emerging technologies on media reporting. This course equips learners with the skills and knowledge needed to produce high-quality, insightful, and engaging media reports across print and digital platforms.

ESP 818: Linguistic Varieties (2 Units)
This course provides comprehensive exploration of the diverse forms and patterns of language use across different regions, communities, and social groups. Students will be exposed to the principles of linguistic variation, covering regional dialects, socio-lects, ethno-lects, and various aspects of language diversity. This course offers a detailed understanding of how languages and dialects adapt and evolve based on geography, social identity, cultural context, and other factors. It equips learners with the knowledge and skills to analyze and appreciate the depth of linguistic diversity. Items to be considered include the following: speech event model and the interactional model, speech community, speech event and speech act, sociolinguistic analysis of basic research issues, Inter-language, varieties in cross-cultural interaction and institutional constraint to language variation.

ESP 899: Master's Dissertation (12 Units)
This is a supervised project in the area of ESP, and it is based on original research. The candidate is expected to contribute to knowledge in the area of ESP, the title of which shall be approved by the School of Postgraduate Studies. The project shall make an original contribution to knowledge. The thesis shall be defended before a panel of internal and external examiners.

PHD IN TEACHING ENGLISH FOR SPECIFIC PURPOSES (TESP)

PROGRAMMES IN TEACHING ENGLISH FOR SPECIFIC PURPOSES

1. POST GRADUATE PROGRAMME OPTIONS

This Programme offers PhD courses as specified below:

A. Doctor of Philosophy in: Teaching English for Specific Purposes (PhD TESP)

2. PROGRAMME PHILOSOPHY

The Institute of Technology-Enhanced Learning and Digital Humanities (INTEDH) is committed to a higher education environment that fosters transformative and reflexive practices in learning and teaching; it strives to create socially responsive and contextually relevant learning and teaching environments supported by technology. The course, Teaching English for Specific Purposes (TESP), has the following key focus areas: course and curriculum design and re-design with technology and educational technology integration. The course incorporates diverse areas such as: English for Academic Purposes (EAP), English for Science and Technology (EST), English for Medical Purposes (EMP), English for Occupational Purposes (EOP) etc. The programme is both theoretical and applied, and covers general Linguistics i.e. Grammar, Stylistics and Discourse Analysis etc. The ESP module focuses on important areas such as: needs analysis, teaching language for specific purposes, issues in ESP syllabus design, ESP course evaluation and teaching of English in special contexts such as Business, Medicine, Law etc. The course, which is underpinned by relevant theories, introduces students to a learner-centered approach to language study, is taught through a blended learning mode, and enriched with a strong emphasis on 21st century skills.

3. PROGRAMME OBJECTIVES

The specific objectives of the programme include the training of specialist English Language teachers and Communication experts who will be capable of integrating technology in language teaching, promote research in ESP, re-orientate English language training in Nigerian Higher Education Institutions (HEIs), and enrich the linguistic environment and repertoire of English language practitioners in applying digital technology as work and research tools. The course provides students a theoretical grounding in language teaching, practice and theory of ESP while incorporating the different strands of ESP such as: English for Occupational Purposes (EOP) and English for Educational or Academic Purposes (EAP). The course will offer opportunities to up skill teachers to develop career in English language teaching and integration of technology.

SPECIFIC OBJECTIVES

Upon graduation, graduates who specialise in English for Specific Purposes will

a. conduct needs analysis of specific groups of learners;
b. be able to evaluate and select ESP teaching materials, methods and be able to conduct course evaluation;
c. create original ESP teaching materials;
d. be equipped with the necessary professional skills and academic competence leading to the study of ESP as a discipline;
e. recommend methods of assessment and testing appropriate for specific ESP contexts
f. make connections between the relevant findings from discourse analysis, in particular from genre analysis and the teaching of ESP discourse skills;

4. PROGRAMME JUSTIFICATION

The PhD programme in Teaching English for Specific Purposes is targeted at professionals who are trained as curriculum designers, test designers, programme managers, instructional technology specialists with competency to apply digital technologies, and who will work in educational institutions, organisations, NGOs, media houses, government establishments and contexts where English is used as a second language, particularly, African countries. Upon graduation, products who specialize in English for Specific Purposes will be able to plan and design ESP programmes for specific learners and prepare appropriate teaching/learning materials for use by specific learners in special contexts, and will be able to apply technology in the contemporary workplace. Courses are taught through a blended learning mode with deployment of appropriate technologies that suit students' learning environment and context while at the same time making room for learner-teacher, learner-learner and learner-content interaction.

5. ADMISSION REQUIREMENTS

Doctor of Philosophy (PhD)

For PhD in Teaching English for Specific Purposes (ESP), suitable candidates will possess a Master's degree in

a. ESP or TESP
b. will have scored a minimum of 60% in the thesis as well as the overall result or CGPA of 3.5 or a 5-point scale.

Ph.D candidates who are not products of INTEDH (FUTA) will be required to take COM 705. The Ph.D programme will include a minimum of four seminar presentations on a topic from any aspect of ESP. PhD students will also mandatorily complete a doctoral thesis.

6. PROGRAMME DURATION

The duration of the ***PhD*** programme shall be as follows:

a. Full-time: 36-48 months
b. Part time: 48-60 months

7. GRADUATION REQUIREMENTS

B. Doctor of Philosophy (Ph.D) Programmes

To be qualified for a doctoral degree in TESP, a candidate must have successfully

a. completed any prescribed course work
b. presented four Departmental Research Project seminars
c. defended the Research thesis in the specialist area at an oral examination organised by the School of Postgraduate Studies.

10. DOCTORAL PROGRAMME IN TESP

COURSE CODE	COURSE TITLE	Course Status	L	T	P	U
COM 705	Facilitating Online	R	0	0	3	1
ESP 999	Dissertation	C	0	0	36	12
						13

ESP 999 Doctoral Thesis 12 units

An original investigation in an area of ESP/ELT, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge. The dissertation must be defended at an open oral examination organised by the School of Postgraduate Studies.

POST GRADUATE DIPLOMA PROGRAMMES (PGD) IN BIOETHICS, APPLIED AND PROFESSIONAL ETHICS AND SECURITY AND INTELLIGENCE STUDIES

1. PROGRAMMES OFFERED

(a) Postgraduate Diploma in Bioethics.

(b) Postgraduate Diploma in Professional and Applied Ethics.

OPTIONS: (i) Business Ethics
(ii) Environmental Ethics
(iii) Ethics of Governance and Public Affairs

(c) Postgraduate Diploma in Security and Intelligence Studies

2. PROGRAMME PHILOSOPHY

Postgraduate programmes in Bioethics, Applied and Professional Ethics and Security and Intelligence Studies are towards helping researchers/academics, leaders, personnel, security agents, policy and decision-makers, in various sectors of life such as government, civil service, education, business, medical practice, military and paramilitary agencies, and so on, who did not study or have background knowledge of philosophy and its applications, or lack an understanding of applications of philosophy in dealing with security and information matters relating to security studies, to update their professional and academic knowledge, of philosophy and its various applications. By these, students will gain in-depth knowledge and awareness of important moral, socio-political, cultural and professional issues and information issues, alongside the understanding of everyday events and how to address the problems facing the society and their various professions. The programmes address the interests of career officers by providing them with good empirical and theoretical backgrounds, in general approaches to ethics and sound practical orientations, in dealing with the ethical aspects of professional and societal problems.

3. PROGRAMME OBJECTIVES

These programmes are designed to:

(a) develop students, researchers, business leaders, personnel, career officers, and policy formulators to have an in-depth knowledge of the nature and relevance of ethics to human and national development;

(b) assist institutional, medical, military and paramilitary personnel to gain an in-depth knowledge of the different professional issues relating to their fields through studying philosophy and applying the tools of information technology;

(c) strengthen and develop their understanding of the principles of ethics and how these may be applied along their various disciplines and career paths;

(d) generate and promote sound understanding of moral principles underlying social actions and professional orientations;

(e) develop in decision-makers and administrators, a high degree of sensitivity to questions of rights and wrongs, and of moral obligation in policy matters; and

(f) address the problems relating to the extensive decadence in public morality and prevalent professional misconducts in public life.

4. PROGRAMME JUSTIFICATION

The Postgraduate Diploma programmes in Bioethics, Applied and Professional Ethics and Security and Intelligence Studies are relevant in contemporary times where reasons for ethical issues in security and professional life are concerned. Students who successfully graduate from these programmes will be more informed about twenty-first century research and technological skills and competencies necessary to enhance their careers as professionals. Giving opportunity for further research studies, the programmes will:

i. Train professionals and decision-makers in various sectors of life, such as government, civil service, education, business, medical practice, military and paramilitary agencies to become specialised in their fields and professions.

ii. Train career officers to have good ethical backgrounds of issues in their fields.

iii. Make students gain in-depth knowledge and awareness of important moral, socio-political, cultural and professional issues and information issues in everyday events

5. ADMISSION REQUIREMENTS

Candidates for admission into the Postgraduate Diploma programme should possess

i. an honours degree in any discipline from the Federal University of Technology, Akure or any other university recognized by the Senate of FUTA.

ii an HND holders at credit level from a recognised institution.

6. PROGAMME DURATION

The PGD programmes shall be full time programmes of eighteen (18) months duration.

7. GRADUATION REQUIREMENTS

To be qualified for a Postgraduate Diploma in Bioethics, Applied and Professional Ethics and Security and Intelligence Studies, a candidate must have:

iv. passed a minimum TLU of 36, including 6 units of research project and 30 units of compulsory or core courses;

v. successfully presented 2 Departmental Research Project seminars

vi. successfully defended the Research Project in the specialist area at an oral examination organised by the School of Postgraduate Studies.

8. COURSE OUTLINE

PGD IN BIOETHICS

FIRST SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 701	C	History of Philosophy and Society	2	0	0	2
APE 703	C	Ethical Theories and Practices	2	0	0	2
APE 705	R	Fundamentals of Bioethics	2	0	0	2
APE 707	C	History of Bioethics	2	0	0	2
APE 709	C	Ethics, Theories of Human Rights and Legal profession	2	0	0	2
APE 711	C	Fundamentals of Biotechnology	2	0	0	2
COM 705	R	Facilitating Online	0	0	3	1
ESP 711	R	Writing Skills	1	0	3	2
	E	Elective Course				2
	TOTAL					17

ELECTIVE COURSES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 719	E	Public Administration and Policy	2	0	0	2
APE 721	E	Ethics and Society	2	0	0	2

SECOND SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 702	C	Introduction to Science, Technology and Ethical Values	2	0	0	2
APE 704	C	Philosophy of Social Sciences	2	0	0	2
APE 706	C	Logic and Critical Reasoning	2	0	0	2
APE 708	C	Sociology of Bioethics	2	0	0	2
APE 710	C	Moral Problems in Bioscience	2	0	0	2
APE 712	C	Ethics of sex (Eugenics)	2	0	0	2
APE 720	C	Seminar	2	0	0	2
APE 722	C	Research Ethics and Methods	2	0	0	2
	E	Elective Course				2
	TOTAL					18

ELECTIVES

APE 718	C	Ethics, Public Affairs and Political Economy	2	0	0	2
SIS 706	C	Introduction to Theories of Justice	2	0	0	2

Third Semester

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 799	C	Postgraduate Diploma Project	0	0	18	6
Total						**6**

PGD IN APPLIED AND PROFESSIONAL ETHICS

FIRST SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 701	C	History of Philosophy and Society	2	0	0	2
APE 703	C	Ethical Theories and Practices	2	0	0	2
APE 713	C	Applied and Professional Ethics	2	0	0	2
APE 715	C	Business Ethics	2	0	0	2
APE 717	C	Environmental Ethics	2	0	0	2
APE 723	C	Public Service Ethics	2	0	0	2
ESP 711	R	Writing Skills	1	0	3	2
COM 705	R	Facilitating Online	0	0	3	1
	E	Elective Course				2
	TOTAL					17

ELECTIVE COURSES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 719	E	Public Administration and Policy	2	0	0	2
APE 721	E	Ethics and Society	2	0	0	2

SECOND SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 702	C	Introduction to Science, Technology and Ethical Values	2	0	0	2
APE 704	C	Philosophy of Social Sciences	2	0	0	2
APE 706	C	Logic and Critical Reasoning	2	0	0	2
APE 718	C	Ethics, Public Affairs and Political Economy	2	0	0	2
APE 720	C	Seminar	2	0	0	2
APE 722	C	Research Ethics and Methods	2	0	0	2
APE 724	C	Contemporary Issues in Business Ethics	2	0	0	2
APE 726	C	Contemporary Issues in Environmental Ethics	2	0	0	2
APE 728	C	Contemporary Issues in Ethics of Governance and Public Affairs	2	0	0	2
		Electives				2
	TOTAL					20

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 702	C	Philosophy of Science and Technology	2	0	0	2
SIS 706	C	Introduction to Theories of Justice	2	0	0	2

THIRD SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 799	C	Postgraduate Diploma Project	0	0	18	6
Total						**6**

PGD IN SECURITY AND INTELLIGENCE STUDIES

FIRST SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 701	C	History of Philosophy and Society	2	0	0	2
APE 703	C	Ethical Theories and Practices	2	0	0	2
SIS 701	C	Introduction to Security, Intelligence and Strategic Studies	2	0	0	2
SIS 703	C	Introduction to Philosophy of Mind and Artificial Intelligence	2	0	0	2
SIS 705	C	Ethics of Peace and Societal Order	2	0	0	2
SOC 709	C	Sociology of Deviant Behaviour	2	0	0	2
ESP 711	R	Writing Skills	1	0	3	2
COM 705	R	Facilitating Online	0	0	3	1
	E	Elective Course				2
		TOTAL				17

ELECTIVE COURSES

APE 709	E	Ethics, Theories of Human Rights and Legal Profession	2	0	0	2
APE 723	E	Public Service Ethics	2	0	0	2

SECOND SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 704	C	Philosophy of Social Sciences	2	0	0	2
APE 706	C	Logic and Critical Reasoning	2	0	0	2
SIS 720	C	Seminar	2	0	0	2
APE 722	C	Research Ethics and Methods	2	0	0	2
SIS 702	C	Philosophy of Science and Technology	2	0	0	2
SIS 704	C	Introduction to Cybersecurity	2	0	0	2
SIS 706	C	Introduction to Theories of Justice	2	0	0	2
SIS 708	C	Philosophical Issues in Security and Intelligence Studies	2	0	0	2
	E	Elective Course				2
		TOTAL				18

ELECTIVES

APE 702	E	Introduction to Science, Technology and Ethical Values	2	0	0	2
APE 728	E	Contemporary Issues in Ethics of Governance and Public Affairs	2	0	0	2

THIRD SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 799	C	Postgraduate Diploma Project	0	0	18	6
Total						**6**

9. COURSE SYNOPSIS

APE 701 History of Philosophy and Society (2 Units)
The Nature of Philosophy; Branches of Philosophy; Periods in Philosophy: Ancient Philosophy, Medieval Philosophy, Modern Philosophy, Continental Philosophy, Oriental Philosophy, African Philosophy; Moral Philosophy; Philosophical Problems; Rational Inquiry; Ethical theories and Fundamentals of Ethics; Philosophy and Science; Philosophy and Religion; Applied Philosophy.

APE 702 Introduction to Science, Technology and Ethical Values (2 Units)
Science, Techniques, Technology and Technoscience; Ethics and Morality; Ethical Questions Regarding Science and Technology; Instrumental Rationality, the Ethical Responsibility of Scientists and Technologists; Justifiable Damage, Risk, Uncertainty and Ignorance.

APE 703 Ethical Theories and Practices (2 Units)
Moral Philosophy; Ethical theories and Fundamentals of Ethics; Ethics and Other Branches of Philosophy, Ethical Relativism and Ethical Objectivism; Moral Philosophy and Science; Moral Philosophy and Religion; Moral Revolution, Moral Practices and National Development; Moral Philosophy in Contemporary African Society.

APE 704 Philosophies of Social Sciences (2 Units)
The Social Sciences; Methods of the Social Sciences; Theories of the Social Sciences; Social Values and Common Good; Structuralism, poststructuralism and postmodernism, constructivism; The interpretative tradition.

APE 705 Fundamentals of Bioethics (2 Units)
History of Medicine, Hippocratic Tradition, Ethics and the Physicians, Right to Healthcare, Prolongation of Life and the Right to Refuse Treatment, Medical Confidentiality, Honesty, Lying, Deception and Withholding the Truth, Killing and the Definition of Death, Terminal illness, Euthanasia, Abortion and Infanticide, Physician's Right to go on Strike or to Advertise his Trade.

APE 706 Logic and Critical Reasoning (2 Units)
Nature of Logic and Arguments (explanations, premises, conclusions, fact and opinions): Inductive (generalizations, reasoning from analogies, problem of induction, etc) and Deductive (Categorical syllogisms and arguments for validity, valid and invalid argument forms; necessary and sufficient conditions); Fallacies (definition, appeal to pity, argument *ad ignorantiam, argumentum ad populum,* ambiguity: equivocation, composition, division. etc); techniques of evaluating arguments; language; definition; Logic and Scientific Reasoning; Logic and Everyday Events.

APE 707 History of Bioethics (2 Units)
The Ancient and Modern Origins of Bioethics: Medical traditions in Babylonia, China, Egypt, India and among the Greeks; Hippocratic Oath; Medical Practice in the Middle Ages; Advances in Medicine and Biology, Medical Professionalism, the Political, Scientific, Social, Cultural and Economic Changes in bioethics; Sub-disciplines of Bioethics and the Contemporary Issues in the Development of Bioethics: Animal Ethics, Medical Ethics, Environmental Ethics; Cultural Wars, Policies and Legal Wars leading to Bioethics studies, etc.; Agency Claims and Moral Status in Bioethics; Institutionalization of Bioethics; Theories and Approaches to Bioethics: Utilitarianism, Egoism, Deontology, Virtue Ethics, Casuistry, Feminism, etc.

APE 708 Sociology of Bioethics (2 Units)
The sociological implications of ethical issues in bioethics. Euthanasia, Artificial Birth Control, Suicide etc.; Bioethics and Sociology; antecedents to the rise of ethics in the biosciences, sensitivity to cultural nuance in ethical reasoning and decision making; the intersection of sociology and bioethics; argument for or against particular ethical issues, exploring the cultural, social, political and professional underpinnings of bioethical debates.

APE 709 Ethics, Theories of Human Rights and Legal Profession (2 Units)
The Concept of Rights; The origin of natural right; The argument for natural right; natural law; jurisprudence; Types of Rights; Human Rights and Its Historical/Evolutionary Conception; Basic Human Rights (Freedom, Justice and Equality); Theories of Human Rights; Socratic-Platonic, Aristotelian, and Thomistic tradition and natural rights

APE 710 Moral Problems of Bioscience (2 Units)
General introduction to bioscience; Basic Introduction to Ethical Problems in Science; Understanding of ethical issues; Ethics and Scientific Innovations; and implications of Science and Technology on Culture: In vitro fertilization (IVF), Cloning, Euthanasia; Impact of bioscience on society; Cultural and social issues in biosciences; Advances in the biosciences.

APE 711 Fundamentals of Biotechnology (2 Units)
The emerging areas of biotechnology, for example provocative and issues in Biotechnology, genetically modified food, genetic testing, embryos for research/human cloning, ethical/legality/social questions & dilemmas will be incorporated.

APE 712 Ethics of Sex (Eugenics) (2 Units)
Sex as a concept, the relevance and importance of sex, sexual impulses and our duties towards the body, prostitution, sexual harassment, sex abuse, rape, homosexuality, the ideals of consent, sex and procreation, marriage, adultery and monogamy, lying to children, parents' duties to children and children's obligations to parents.

APE 713 Applied and Professional Ethics (2 Units)
Applied ethics and the traditions of moral philosophy; Issues in Applied Ethics; Professional Codes of Conduct and the anti-graft agencies (Money Laundering, Corporate Fraud and Whistle Blowing); Personal Ethics versus Organisational Ethics, Public service ethics; ethics of whistle blowing; corrupt practices and ethical views.

APE 715 Business Ethics (2 Units)
Business and Morality; Fundamentals of Business Ethics; Business Ethics and Theories of Normative Ethics; Business, Social Environment, Corporate Morality and Corporate Social Responsibility; Ethical Theory and Decision-making in Businesses; Religion, Culture, Business and Ethics.

APE 717 Environmental Ethics (2 Units)
The Social Environment; Issues in Environmental Ethics; Environmental Rights and Justice; Industrialization and Environmental Ethics; Violent Conflicts and Environmental Ethics; Political Conflicts and Environmental Ethics, Social Change and Environmental Ethics.

APE 718 Ethics, Public Affairs and Political Economy (2 Units)
The importance of ethics in public service, classical versus contemporary theory and foundation of public service ethics, a ethical standard in public service, ethics and integrity in public service in Nigeria, ethical dilemma in public service eg Oat of secrecy and process of resolving it; concepts and characteristics of political economy, ethics of political economy; global political economy, global economic order, etc.

APE 719 Public Administration and Policy (2 Units)
The concept of public administration and policy studies, comparative study of public administration and political science, historical and legal approaches to the study of public administration and policy making process, Theories of policy making process and implementation in public service. The roles of public service in policy formulation and implementation, public service code of ethics in Nigeria.

APE 720 Seminar (2 Units)
Each student will be required to present two seminars on approved topics on areas in Bioethics, Applied and Professional Ethics or Security and Intelligence Studies, as appropriate.

APE 721 Ethics and Society (2 Units)

Theories of Origin of Society and Social Origin of Morality (Creationism, Evolution, Contractarianism, etc.); Ethics' Influence on Societal formation; Individualism, Society and the Ethical Basis of the Social Contract Theories; Self-Interest, Moral Obligation and Common Good; Consequences of Ethical Ethics, Societal Change and Development.

APE 722 Research Ethics and Methods (2 Units)
Ethical guides and research methodology (plagiarism, authorship, mentor-mentee, methods of data collection and analysis, etc.); research methods in the Sciences, the Humanities and Social Sciences; Defining Research Problem and its Guidelines; Related Literature in Research; Grants Writing in Research; Steps in Social Science Research

APE 723 Public Service Ethics (2 Units)
What and why of public service ethics, Infrastructures/principles of public service ethics, local and international norms and legislations in public service, public service ethics and administrative reforms, public service ethics and conflict of interest, bureaucratic corruption and institutionalising ethics in public service, challenges of modern public administration and ethical decisions.

APE 724 Contemporary Issues in Business Ethics (2 Units)
The course aims at giving an in-depth understanding of contemporary ethical issues in business management such as harassment and discrimination, social networking, business transactions, profit making and social responsibility, competencies and securing of right talents, outsourcing, job uncertainty, technology and innovations, customer service, job mobility and transfer, the future of jobs, etc.

APE 726 Contemporary Issues in Environmental Ethics (2 Units)
It examines the fundamental ethical issues in the following: Human relationships with the environment; Climate change, pollution and human wellbeing, Pollution and Species extinction; Afforestation and Deforestation; Ecology, biodiversity and wetlands; Industrialization and worldwide transportation of toxic substances; Decline of coastal quality and degradation of freshwater; African indigenous solutions to environmental problems

APE 728 Contemporary Issues in Ethics of Governance and Public Affairs (2 Units)
It assists students to understand the concept and varieties of contemporary ethical issues in governance and public affairs such as governing by contracting (outsourcing), development planning, economic structural adjustment programmes, foreign diplomacy and policies, capacity and institutional development, decentralisation in public sector, public-private partnership, tri-parties partnership for economic development, introduction of technology in public sector, social equity and transparency, etc.

APE 799 Project (6 Units)
This will be an original investigation in an area of APE/SIS, the title of which shall be approved by the School of Postgraduate Studies, and will make an original contribution to knowledge.

SIS 701 Security, Intelligence and Strategic Studies (2 Units)
Key concepts and approaches in the study of security, intelligence and strategic studies; history, evolution, development and prospects of international security; theoretical approaches and debates in world politics (from ancient to modern times); security institutions (local, regional and international); world politics and international security; origination and causes of wars; role of force in international relations, deterrence and coercion (theory and practice), diplomacy and international dynamics, threats to national and global security (terrorism, etc.).

SIS 702 Philosophy of Science and Technology (2 Units)
What is science? Philosophy and Science. Methods of Science. Scientific truth and concepts, Technology. Definition of Science, scope, aims and branches of philosophy of science, methods of science and its limitation, scientific tools and concepts, general errors in scientific reasoning, limitation of scientific knowledge etc.

SIS 703 Introduction to Philosophy of Mind and Artificial Intelligence (2 Units)
Nature of mind; What is mind?; Theories of Mind: Cartesian Dualism, Substance theory, Bundle theory and the Stream of Consciousness theory; Mind-Body Problem: Monism, Dualism, Reductive Materialism, 20th Century Central State Materialism, Identity theory, Epiphenomenalism, Parallelism and Occasionalism.

SIS 704 Introduction to Cybersecurity (2 Units)
Key terms and concepts in the field of Cybersecurity; threat actors and their motivations; appropriate types of controls to the actions of different threat actors; differences and interactions among international agencies related to Cybersecurity; potential legal challenges to Cybersecurity in Nigeria.

SIS 705 Ethics of Peace and Societal Order (2 Units)
Concepts and theories of peace; Morality and the demand of Peace; Ethics of Peace and Violence; Ethics and Societal Order; The Imperative of Justice; Types and Theories of Justice, The demands of Justice and Societal Order; Just and Unjust wars, Social Peace, Dimensions of War (cyber war, ethnic, religious, terrorism, nuclear/biological, intercultural, economic, political, moral, social, psychological, etc.); international peace-keeping efforts (NATO, UN peace keeping force, AU, ECOMOG, etc.); African traditional approaches to peace (adjudication, alternative dispute resolution, retribution, etc.); peace, welfare and societal order.

SIS 706 Introduction to Theories of Justice (2 Units)
Understanding Theories of Justice, Systems of Justice (African: Yoruba, Igbo and Hausa) and Western Appr oaches (Europe, America, and Asia). Justice in Religion (Islamic, Christianity, etc.); Problems of Justice, The Co ncept of Jungle Justice, Types of Justice (Distributive.R etributive, etc), Rule of Law and Constitutionalism.

SIS 708 Philosophical Issues in Security and Intellig ence Studies(2 Units)
The Course Addresses Issues Involved in the Epistemology, Metaphysics, Ethics and Logic of Security in Relation to Intelligence in Government, Different Para-military and Military Groups (Police, Immigration, Customs, etc.), International Agencies and Private Sectors. It focuses on Intelligence and Security Issues

Relating to Criminology, Local and Global/Transnational Terrorism and Violence, Terrorism and Counterterrorism Involving State and Non state actors, Financial Terrorism, Funding of Terrorism, Online Security and Fraud, and Indigenous Approaches to Terrorism.

SIS 720 Seminar (2 Units)
Each Student will be required to present two seminars on approved topics on areas in Bioethics, Applied and Professional Ethics or Security and Intelligence Studies, as appropriate.

SIS 799 Project (6 Units)
This will be an original investigation in an area of APE/SIS, the title of which shall be approved by the School of Postgraduate Studies, and will make an original contribution to knowledge.

COM 705 Facilitating Online (1 Unit)
A model for online facilitation; Building interaction into webinars; Developing strategies to encourage participation; Scheduling facilitation; Exploring facilitation; Preparing summaries; Preparing weaves; Effective online facilitation; Facilitating and hosting webinars; Delivering with style and confidence; Technical and trouble-shooting skills; Gaining ideas for self-paced online activities; Developing ways of working together as a group; Developing guidelines for effective online facilitation; Deepening connections; Dealing with diversity; Managing conflict; Creating an online activity; Adventure into the World Wide Web.

ESP 711 Writing Skills (2 Units)
The students will be introduced to the general principles guiding effective communication, writing features, writing science popularization, writing reports, writing minutes of meeting, writing for the media etc. Fundamental elements of punctuation, aspects of grammar, specialized writing, and basic news writing will be considered.

SOC 709 Sociology of Deviant Behaviour (2 Units)
Survey of theories of Deviant Behaviour with emphasis on cross-cultural studies. Attempt is made to evaluate extant theories of deviance in the light of empirical data of deviance from industrialized and non-industrialized of the emergent societies. Functions and dysfunctions of deviance in the society; A practical analysis of common deviant acts in Nigeria.

(M.Sc. in BIE, APE and SIS)

PROGRAMME IN BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS, SECURITY AND INTELLIGENCE STUDIES

1. POSTGRADUATE PROGRAMMES OPTIONS

The programmes offer Masters courses as stipulated below:

Master of Science in:

A. Bioethics (M.Sc. BIE)
B. Applied and Professional Ethics and Public Affairs (M.Sc. APE)

OPTIONS:
(i) Business Ethics
(ii) Environmental Ethics
(iii) Ethics of Governance and Public Affairs

C. Security and Intelligence Studies (M. M.Sc. SIS)

2. PROGRAMME PHILOSOPHY

The Institute of Technology-Enhanced Learning and Digital Humanities (INTEDH) is committed to a higher education environment and technology-based knowledge impartation through purposeful learning and teaching. The Postgraduate Master's programmes in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies aim at helping researchers/academics, leaders, personnel, security agents, policy and decision-makers, in various sectors of life such as government, civil service, education, business, medical practice, military and paramilitary agencies to update their professional and academic knowledge, through technology-integrated (blended) learning, by providing them with empirical and theoretical

backgrounds in dealing with the ethical aspects of professional and societal problems. Thus, the courses which are undergirded by relevant theories introduce students to learner-centred approach to Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies enriched with strong emphases on contemporary technological skills.

3. PROGRAMME OBJECTIVES

These programmes are designed to:

(a) Train researchers, business leaders, personnel, career officers, and policy formulators to have in-depth knowledge of the theory and application of ethics through technology-assisted learning;

(b) Train experts and professionals who can combine sound technical and theoretical knowledge with sophisticated practical skills in meeting Nigeria's contemporary developmental needs.

(c) Equip professionals in multinationals, governmental and nongovernmental organisations who can utilise requisite technologies in 21st century skills workplace.

(d) Equip institutional, medical, military and paramilitary personnel to gain in-depth knowledge of the different ethical issues relating to their fields of specialisation through the application of the relevant tools of information technology.

4. PROGRAMME JUSTIFCATION

The M. Tech programmes in Bioethics, Applied and Professional Ethics and Public Affairs, Security and Intelligence Studies are relevant in contemporary times when issues on ethics and security have become a global challenge. Students who successfully graduate from the programme will be adequately equipped with twenty-first century research and technology-assisted skills and competencies necessary to enhance their careers as professionals. Giving opportunity for further research studies, the programmes will:

i. Train professionals and decision-makers in various sectors of life, such as government, civil service, education, business, medical practice, military and paramilitary agencies to become specialised in their fields and professions.

ii. Train career officers to have good ethical backgrounds of issues in their fields.

iii. Make students gain in-depth knowledge and awareness of important moral, socio-political, cultural and professional issues and information in everyday events

5. ADMISSION REQUIREMENTS

Academic requirements for admission into the Master's degree in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies must include:

i. Being holders of a good Bachelor's degree in Philosophy, Humanities and Social Sciences and other related disciplines with a minimum of Second (2nd) Class Lower Division from any university recognised by FUTA senate.

ii. Being holders of PGD with a minimum of Upper Credit in either of Bioethics, Applied Professional Ethics and Public Affairs, Security and Intelligence Studies from any university recognised by FUTA senate.

6. PROGAMMES' DURATION

a. Master's degrees:
   i. Full-time: 18-24 months

7. GRADUATION REQUIREMENTS

I. Master's Degree in:

i. Bioethics,
ii. Applied Professional Ethics and Public Affairs
iii. Security and Intelligence Studies

To qualify for Master's degree in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies, a candidate must have

i. accumulated a minimum TLU of 45, including 12 units of research project and 33 units of compulsory or core courses;
ii. successfully presented three (3) Departmental Research Project seminars
iii. successfully defended the Research Project in the specialist area at an oral examination organised by the School of Postgraduate Studies.

Note: 1. All courses will be delivered by blended learning.

2. COM 705 (Facilitating Online) will be compulsory for all students who did not offer PGD in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies at INTEDH FUTA.

8. COURSE OUTLINE

MASTER'S PROGRAMMES IN BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS, SECURITY AND INTELLIGENCE STUDIES

FIRST SEMESTER

COMPULSORY COURSES (BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 801	C	Advanced History of Philosophy and Society	3	0	0	3
APE 803	C	Advanced Applied and Professional Ethics	3	0	0	3
ESP 813	R	Advanced Writing Skills and Document Design	2	0	0	2
COM 705***	C	Facilitating Online	1	0	0	1
APE 805	C	Research Ethics and Methods	3	0	0	3
	E	Electives courses				6
	TOTAL					18

***Only compulsory for course for those who did not do PGD in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies at INTEDH FUTA.

ELECTIVE COURSES (MASTER'S IN BIOETHICS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 807	E	Theories and Practice of Human Rights/ Morality	3	0	0	3
APE 809	E	Advanced Studies in Bioethics	3	0	0	3
APE 811	E	Advanced History of Medicine	3	0	0	3
SOC 813	E	Sociology of Bioethics	3	0	0	3
	TOTAL					

ELECTIVE COURSES (MASTER'S IN APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 813	E	Ethics, Society & Corrupt Practices	3	0	0	3
APE 815	E	Science, Technology and Ethical Values	3	0	0	3
APE 817	E	Public Administration and Policy	3	0	0	3
SOC 805	E	Advanced Medical Sociology	3	0	0	3
	TOTAL					

SECOND SEMESTER

COMPULSORY COURSES (BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS)

APE 802	C	Global Ethics	3	0	0	3
APE 804	C	Ethical Issues in Science and Technology	3	0	0	3
APE 806	C	Ethics and Life Issues	3	0	0	3
APE 808	C	Advanced Critical Thinking	3	0	0	3
	E	Electives courses				6
	TOTAL					16

ELECTIVE COURSES (MASTER'S IN BIOETHICS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 810	E	Morality and Social Change	3	0	0	3
APE 812	E	Advanced Moral Problems in Bioscience	3	0	0	3
APE 814	E	Gender and Culture in Health Care	3	0	0	3
APE 816	E	Advanced Biotechnology	3	0	0	3
	TOTAL					

Students are expected to take at least two elective courses

ELECTIVE COURSES (MASTER'S IN APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 818	E	Business Ethics	3	0	0	3
APE 820	E	Environmental Ethics	3	0	0	3
APE 822	E	Ethics of Technology and Engineering	3	0	0	3
APE 824	E	Ethics and Public Affairs	3	0	0	3
	TOTAL					

Students are expected to take at least two elective courses

THIRD SEMESTER AND FOURTH SEMESTER

COMPULSORY COURSES (BIOETHICS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 825	C	Seminar I	2	0	0	2
APE 827	C	Seminar II	2	0	0	2
APE 899	C	Master's Dissertation	0	0	36	12
	TOTAL					16

COMPULSORY COURSES (APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 825	C	Seminar I	2	0	0	2
APE 827	C	Seminar II	2	0	0	2
APE 899	C	Master's Dissertation	0	0	36	12
	TOTAL					16

MASTER'S IN SECURITY AND INTELLIGENCE STUDIES

FIRST SEMESTER

COMPULSORY COURSES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 801	C	Philosophy of Mind	3	0	0	3
SIS 803	C	Deviant Behaviours and Criminology	3	0	0	3
SIS 805	C	Community Policing and Security analysis	3	0	0	3
COM 705***	C	Facilitating Online	1	0	0	1
APE 805	C	Research Ethics and Methods	3	0	0	3
ESP 813	R	Advanced Writing Skills and Document Design	2	0	0	2
	E	Elective courses				6
	TOTAL					21

***Only compulsory for those who did not do PGD in Security and Intelligence Studies at INTEDH FUTA.

Students are expected to take at least one elective course

ELECTIVE COURSES (Security and Intelligence Studies)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 815	E	Science, Technology and Ethical Values	3	0	0	3
APE 803	E	Advanced Applied and Professional Ethics	3	0	0	3
APE 807	E	Theories and Practice of Human Rights/ Morality	3	0	0	3
APE 813	E	Ethics, Society & Corrupt Practices	3	0	0	3
APE 817	E	Public Administration and Policy	3	0	0	3
	TOTAL					

SECOND SEMESTER

COMPULSORY COURSES IN MASTER'S IN SECURITY AND INTELLIGENCE STUDIES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 802	C	Advanced Ethics of Peace and Societal Order	3	0	0	3
SIS 804	C	Cybernetics and Artificial intelligence	3	0	0	3
SIS 806	C	Security and Strategic Studies	3	0	0	3
SIS 808	C	Security Ethics and Social Change	3	0	0	3
APE 808	C	Advanced Critical Thinking	3	0	0	3
	E	Elective courses				6
	TOTAL					21

ELECTIVE COURSES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 802	E	Global Ethics	3	0	0	3
APE 804	E	Ethical Issues in Science and Technology	3	0	0	3
APE 810	E	Morality and Social Change	3	0	0	3
APE 812	E	Advanced Moral Problems in Bioscience	3	0	0	3
APE 816	E	Advanced Biotechnology	3	0	0	3
APE 824	E	Ethics and Public Affairs	3	0	0	3

THIRD SEMESTER AND FOURTH SEMESTER

COMPULSORY COURSES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 825	C	Seminar I	2	0	0	2
SIS 827	C	Seminar II	2	0	0	2
SIS 899	C	Master's Dissertation	0	0	36	12
	TOTAL					16

9. COURSE DESCRIPTION

APE 801 Advanced History of Philosophy and Society (3 Units)
History of Western philosophy (from pre-Socratic Philosophers as Ionian philosophers, Socrates/Plato, Aristotle, Medieval, Islamic philosophy, etc); Continental Philosophy, Indian Philosophy (Hinduism, Buddhism, Ghandi's Ahimsa, etc); Chinese philosophy (Confucius, Lao Tzu, Mencius, etc), African Philosophy (Bodunrin, Hountoundji, Oruka, Sodipo, Nkrumah, Kaunda, Nyerere, Awolowo, Azikwe, etc); Major Problems of philosophy and issues related to society.

APE 802 Global Ethics (3 Units)
Globalization and internationalization; Aspects of Globalization; Environmentalism and Ethics of Climate Change, Ethical implications of terrorism (local and international), Economic Turmoil, Inequality (economic, racial, social, political, religious, etc); Ethics and International Affairs, Ethics and Global Politics; Ethics and International Business

APE 803 Advanced Applied and Professional Ethics (3 Units)
Contemporary Issues in Applied Ethics (Abortion, Animal Rights, Euthanasia, etc. What is a profession?; Professional Codes of Conduct; Personal Ethics versus Organisational Ethics; Professional values (Confidentiality, deception, honesty, justification, excuses, etc); Aspects of Applied Ethics (Business Ethics, Leadership and Institutional Ethics, Ethics of Public Life and media, Ethics of work, Ethics of sports, Medical Ethics, Environmental Ethics, etc).

APE 804 Ethical Issues in Science and Technology (3 Units)
What is science? Relationship between Science and Technology; Ethical issues in technology; Ethical Values versus Social Values; Societal Ethical Values and Science and Technology; Ethics and decision-making in science and technology; micro and macro ethics in

science and technology Ethics and Public Affairs; codes of ethics in science and technology

APE 805 Research Ethics and Methods (3 Units)
Fundamentals of research ethics; Research Methods; Methods in the Sciences, the Humanities and Social Sciences; Research Methods; Research Problem and its Guidelines; Ethical Rules and Research (Writing Ethics; Plagiarism; Grants writing ethics, etc); Research Institutions and Ethical Policy Statements (RIB).

APE 806 Ethics and Life Issues (3 Units)
Contemporary ethical and legal issues. Sex and gender. Legal Implications of ethical issues such as abortion, birth-control, pre-birth testing, reproductive cloning, embryonic stem cell research, euthanasia, suicide, etc. Ethics, Law and Governmental/ Public Policies; Ethics and Medical Profession. Ethics, Law and Researches. Law and Ethics of Technology; Legal issues in Business Ethics.

APE 807 Theories and Practice of Human Rights/Morality (3 Units)
Human/Moral Rights and Its Historical/Evolutionary Conception; Basic Human Rights (Freedom, Justice and Equality); Theories of Human Rights (Natural Rights, Social Rights, Legal Rights and Economic Rights); Limits of Human Rights; Dischargeable and Non-dischargeable Rights and Obligations; Rights of Future Generations; Declaration of Rights (Universal Declaration of Human Rights; African Charter of Human and Peoples' Rights, etc).

APE 808 Advanced Critical Thinking (3 Units)
Nature of Arguments: Inductive and Deductive (Categorical syllogisms and arguments for validity, valid and invalid argument forms; necessary and sufficient conditions); Fallacies (definition, appeal to pity, argument ad ignorantiam, argumentum ad populum, ambiguity: equivocation, composition, division. etc); techniques of evaluating arguments; language; definition; Logic and Scientific Reasoning; Logic and Everyday Events.

APE 809 Advanced Studies in Bioethics (3 Units)
Bioethics and the advances in the fields of life sciences; Moral questions related to patient's death and suffering; moral dilemma (between killing and letting die); ethical issues in care planning; rights of pregnant women and the life of foetus; informed consent and medical treatment; parental control and genetic make-up of children; health care and resources, therapies and cost implications, organ sales and transplantation; medical services and consciences

APE 810 Morality and Social Change (3 Units)
Man and Social Existence; The Concept of Social Change; Ethics and Theories of Development; Social Changes and Society; Technological Changes and Social Change; Social Change and Moral Development. Social Change and Mental Health; Cultural Change and Social Change; Aspects of Social Change (Industrial Change, Cultural Change, Evolutionary change, Educational Change, Socio-Cultural Movements/Revolutions, etc); Factors of Social Change (Technological, Cultural, Natural, Demographic, etc); Theories of Social Change; Ethics, Social Affairs and Social Change; Social Change and Moral Change in Human Societies
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APE 811 Advanced History of Medicine (3 Units)

History of Medicine, Hippocratic Tradition, Ethics and the Physicians, Right to Healthcare, Prolongation of Life and the Right to Refuse Treatment, Medical Confidentiality, Honesty, Lying, Deception and Withholding the Truth, Killing and the Definition of Death, Terminal illness, Euthanasia, Abortion and Infanticide, Physician's Right to go on Strike or to Advertise his Trade, Question of autonomy; Religion and Human Rights; Ethical Issues in the International Guidelines for Determination of Death; Health Risk and Hazards in Health Care Ethics.

APE 812 Advanced Moral Problems in Bioscience (3 Units)
Advanced Ethical Problems in Science; General introduction to bioscience; Basic Introduction to Ethical Problems in Science; Understanding of ethical issues; Ethics and Scientific Innovations; and implications of Science and Technology on Culture: In vitro fertilization (IVF), Cloning, Euthanasia; Impact of bioscience on society; Cultural and social issues in biosciences; Advances in the biosciences

APE 813 Ethics, Society and Corrupt Practices (3 Units)
Ethics and Corruption; Causes of Corruption; Consequences and Cures of Corruption; Corruption, Human Nature and Moral Values; Justice, Corruption and Societal Values; Corruption in the Private and Public Sectors; Eradication of Corruption.

APE 814 Gender and Culture in Healthcare (3 Units)
The concept of culture, gender and health; Cultural norms as significant determinant of gender biased practices that impairs health; difference in biological and social definition of gender and sex; the intersection of gender with other drivers of inequalities, discrimination,

marginalization and social exclusion. Harmful Traditional Practices (HTPs) against women e.g. Child Marriage, Female Genital Mutilation (FGM), son preferences etc. Inequalities and violence against girls and women. Fundamental Human Right.

APE 815 Science, Technology and Ethical Values (3 Units)
Advanced studies in Science and Technology. Ethical Values versus Social Values. Societal Ethical Values and Science and Technology; The impact of science and technology on ethical issues; science and modern advances; evolving diseases, hazards and ethical issues; freedom of information and consent unethical related matters in science and technology; science, technology, political influences and ethics

APE 816 Advanced Biotechnology (3 Units)
Fundamental understanding of biotechnological, molecular biology and genetic engineering; Understanding of the scientific principles and how these have been used to advance biotechnology and industrial bioprocesses. The course lays the foundation for in-depth studies of biological systems being, or with potential for, commercial exploitation.

APE 817 Public Administrations and Policy (3 Units)
Concept of policy and public administration; Historical and Legal Approaches to the Study of Public Policy and Administration; Theories of Public Policy-making process; Public Policy-making process and administration; Core Themes of Public Policy; The role of public Service in Policy formulation and implementation; Public Service code of ethics in Nigeria.

APE 818 Business Ethics (3 Units)
Business Ethics and Theories of Normative Ethics (Deontologism/Rule Based and Teleological/Consequential Theories, Virtue Ethics, Moral Relativism, Moral Absolutism, Social Contract Theories; Gender theory, etc); Ethical Theory and Decision-making in Businesses; Business, Social Environment, Corporate Morality and Corporate Social Responsibility; Religion, Culture, Business and Ethics; Ethics and the Employer-employee Relationship; Ethics and Corporate Governance; Ethics and Marketing; Politics, Policy Formulation and Business Ethics; Social Factors, Social Change and Business Ethics; Business Ethics and Africa.

APE 820 Environmental Ethics (3 Units)
Contemporary Issues in Environmental Ethics; Environmental Rights; Industrialization and Environmental Ethics; Violent Conflicts and Environmental Ethics; Politics Conflicts and Environmental; Environmental Ethics in Nigeria; environmental justice; social and distributive justice

APE 822 Ethics of Technology and Engineering (3 Units)
Meaning and scope of technology and engineering ethics; concepts applied in engineering ethics; Ethics and Technology; Technological Usage and Ethics; Ethicists in the Age of Technology; Technoethics and Social Development; Evolution of ethical concerns in Science and Technology; methodologies for ethical decision-making in engineering; moral dilemma in Engineering profession; codes of ethics in engineering profession

APE 824 Ethics and Public Affairs (3 Units)
Core ethical issues in public affairs, ethical theories in public affairs, public ethics and accountability, oath of secrecy and moral dilemma in public affairs, example freedom of information versus oath of secrecy, theoretical principles for analysis of ethical dilemma in public affairs, daily operation in public offices versus lobbying, political party affiliations and elections.

APE 825 Seminar I (2 Units)
Students will be required to give a seminar on a chosen topic within the curriculum.

APE 827 Seminar II (2 Units)

Students will be required to give a seminar on a chosen topic within the curriculum.

APE 899 Master's Dissertation (12 Units)
A project report of not more than 15,000 words (excluding appendices) written by the student on any topic approved by the Department.

SIS 801 Philosophy of Mind (3 Units)
Nature of mind; What is mind?; Theories of Mind: Cartesian Dualism, Substance theory, Bundle theory and the Stream of Consciousness theory; Mind-Body Problem: Monism, Dualism, Reductive Materialism, 20th Century Central State Materialism, Identity theory, Epiphenomenalism, Parallelism and Occasionalism.

SIS 802 Advanced Ethics of Peace and Societal Order (3 Units)
Advanced concepts and theories of peace; Morality and the demand of Peace; Ethics of Peace and Violence; Ethics and Societal Order; just and unjust wars, social

peace, dimensions of war (cyber war, ethnic, religious, terrorism, nuclear/biological, intercultural, economic, political, moral, social, psychological, etc); international peace-keeping efforts (NATO, UN peace keeping force, AU, ECOMOG, etc); systems of justice (African and Western approaches); African traditional approaches to peace (adjudication, alternative dispute resolution, retribution, etc); peace, welfare and societal order.

SIS 803 Deviant Behaviours and Criminology (3 Units)
Theories and explanation of Deviance, Criminality, Delinquency, violence and social change. Institutional change arising from sustained contacts with other cultures, as well as Diffusion, Western Civilization in Africa, Asia and Latin America, focusing on the new types of violence and criminality that have emerged. Violence and changing patterns of criminality such as political assassination during election campaigns, daylight bank robbery, airplane hijacking, violence against law enforcement agents e.g. customs and police.

SIS 804 Cybernetics and Artificial Intelligence (3 Units)
The history and philosophy of cybernetics and Artificial Intelligence: the science of cybernetics and the views of Leibnitz and Descartes on control and mechanisms; Basic ideas and concepts in cybernetics and Artificial intelligence. Humans, information machines, consciousness and intelligence; The nature, problems and methods in cybernetics and Artificial intelligence; Cybernetics, Artificial intelligence and meaning; Artificial systems and natural systems; The logic of behaviour; Psychology, cybernetics, Artificial Intelligence and everyday life: industry, government, military, socio-economic, etc.

SIS 805 Community Policing and Security Analysis (3 Units)
Knowledge-Based Policing, Policing and Society in Context, Policing, Leadership and Ethics, Military and Security Responses to Terrorism Community Policing Responses to Violent Extremism Leading to Terrorism, Intelligence Analysis, Contemporary Issues in Crime, Safety and Security, Terrorism, Policing and Security services.

SIS 806 Security and Strategic Studies (3 Units)
Examination of the advanced studies on Security and Strategic Studies. The course covers key concepts and approaches in the study of security. It covers the history, evolution, development and future of international security. The studies include the origination and causes of wars, role of force in international relations, deterrence and coercion (in both theory and practice), diplomacy and international dynamics, and current threats to national and global security, such as terrorism.

SIS 808 Security Ethics and Social Change (3 Units)
The concepts of Security Ethics and social change defined and fully explained; Security as intertwined with societal growth and development; Types of societies as typified by nature and expanded understanding about change and the complexity of the world; Security affairs in the world; Forces of change in the world: Economic, Social, Moral, Technological, etc.; Security ethics and socio-economic and moral consequences of change.

SIS 825 Seminar I (2 Units)
Students will be required to give a seminar on a chosen topic within the curriculum.

SIS 827 Seminar II (2 Units)
Students will be required to give a seminar on a chosen topic within the curriculum.

SIS 899 Master's Dissertation (12 Units)
A project report of not more than 15,000 words (excluding appendices) written by the student on any topic approved by the Department.

POST GRADUATE PROGRAMME IN BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS, AND SECURITY AND INTELLIGENCE STUDIES

(M.Phil in Bioethics, APE and SIS)

1. POSTGRADUATE PROGRAMMES OPTIONS

The programmes offer M.Phil course as stipulated below:

M.Phil in:

a. Bioethics (Bioethics)
b. Applied Professional Ethics and Public Affairs (APE)
c. Security and Intelligence Studies (SIS)

2. PROGRAMME PHILOSOPHY

The Institute of Technology-Enhanced Learning and Digital Humanities (INTEDH) is committed to a higher education environment and technology-based knowledge impartation through purposeful learning and teaching. The M.Phil. programmes in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies aim at helping researchers/academics, leaders, personnel, security agents, policy and decision-makers, in various sectors of life such as government, civil service, education, business, medical practice, military and paramilitary agencies to update their professional and academic knowledge, through technology-integrated (blended) learning, by providing them with empirical and theoretical backgrounds in dealing with the ethical aspects of professional and societal problems. Thus, the courses which are undergirded by relevant theories introduce students to learner-centred approach to Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies and are enriched with strong emphases on contemporary technological skills.

3. PROGRAMME OBJECTIVES

These programmes are designed to:

(a) Train students to acquire necessary research skills and gain the theoretical and empirical knowledge for critical thinking and analysis in their fields.
(b) Train researchers, business leaders, personnel, career officers, and policy formulators to have in-depth knowledge of the theory and application of ethics through technology-assisted learning.
(c) Train experts and professionals who can combine sound technical and theoretical knowledge with sophisticated practical skills in meeting contemporary developmental needs.
(d) Equip professionals in multinationals, governmental and nongovernmental organisations who can utilise requisite technologies in 21st century skills workplace.
(e) Equip institutional, medical, military and paramilitary personnel to gain in-depth knowledge of the different ethical issues relating to their fields of specialisation through the application of the relevant tools of information technology.

4. PROGRAMME JUSTIFCATION

The M.Phil programmes in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies are relevant in contemporary times when issues on ethics and security have become a global challenge. Students who successfully graduate from the programmes will be adequately equipped with twenty-first century research and technology-assisted skills and competencies necessary to enhance their careers as professionals. Giving opportunity for further research studies, the programmes will:

i. Meet the research needs of students and prepare them for the acquisition of independent researches skills that will enhance their abilities to proceed to the Doctor of Philosophy (Ph.D.) programme.
ii. Train professionals and decision-makers in various sectors of life, such as government, civil service, education, business, medical practice, military and paramilitary agencies to become specialised in their fields and professions.
iii. Train career officers to have good ethical backgrounds of issues in their fields.
iv. Make students gain in-depth knowledge and awareness of important moral, socio-political, cultural and professional issues and information in everyday events

5. ADMISSION REQUIREMENTS

Academic requirements for admission into the M.Phil degrees in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies:

i. M.Phil. candidates must have scored between 50% and 54% or 2.4 - 2.99 on a 5 point scale at the Masters Degree programme.

6. PROGAMMES' DURATION

a. M.Phil

i. Full-time: 12-18 months

7. GRADUATION REQUIREMENTS

M.Phil, in:

i. Bioethics,
ii. Applied Professional Ethics and Public Affairs
iii. Security and Intelligence Studies

To qualify for the award of the M.Phil in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies, the requirements for graduation for any candidate who could not successfully convert to Ph.D programme shall be as follows:

i. Candidate must have passed a minimum of 27 course units including 12 units of an independent research thesis and attain at least a pass mark of 50% in every course offered.
ii. Candidate must have successfully presented two seminar papers (proposal and progress seminars) and passed all prescribed courses.
iii. Candidate must have successfully completed and defended the research thesis in/at oral examination.
iv. To be eligible to proceed to Ph.D, the candidate must have scored an average of 60% or a minimum of 3.50 and above on a 5 point grading scale.
v. The candidate who does not satisfy the requirement to proceed to Ph.D, will be awarded a terminal degree of M.Phil after successfully:
    a. Passing all courses prescribed by INTEDH with a minimum score of 50% in each course.
    b. Presenting at least 2 seminars papers (at proposal and progress report seminar levels) on a topic approved by the School of Postgraduate Studies Advisory Committee.
    c. Completing the registration of thesis title in line with the regulations of the School of Postgraduate Studies.
    d. Successfully defending a research thesis at an oral examination organized by the School of Postgraduate studies.
    e. Satisfying other conditions prescribed by the School of Postgraduate Studies for the award of M.Phil.

REQUIREMENTS FOR CONVERSION FROM M.Phil. TO Ph.D.

To convert from M. Phil. a candidate must have successfully:

i. Presented at least two seminar papers (at proposal and progress seminar levels).
i. Prepared and submitted a research plan considered suitable for pursuing a Ph.D. degree to the Postgraduate School through INTEDH.
ii. Presented a detailed report of research-work done up to the time of seeking conversion and submitted to the School of Postgraduate Studies any relevant published and unpublished materials that can be assessed by INTEDH.
iii. Completed all course works with a CGPA of not less than 3.5 or 60% aggregate score in the M.Phil. programme.
iv. Passed an oral transfer examination to be conducted by a panel drawn from INTEDH on the subject of the research undertaken and related topics to the candidate's field of study.
v. Fulfilled all other conditions approved by the University Senate.
vi. Candidate must obtain and complete a Ph.D Conversion Form as appropriate.

8. COURSE OUTLINE

M.PHIL IN BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS, AND SECURITY AND INTELLIGENCE STUDIES

M.Phil. in Bioethics

FIRST SEMESTER

COMPULSORY COURSES (BIOETHICS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 829	C	The Nature and Principles of Bioethics	3	0	0	3
APE 831	C	Research Methodology	3	0	0	3
COM 705	C	Facilitating Online***	1	0	0	1
ESP 813	R	Advanced Writing Skills and Document Design***	2	0	0	2
	E	Elective				9
	TOTAL					18

***Only for those who did not do MSc in Bioethics at INTEDH FUTA.

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 833	E	Advances in Bioethics	3	0	0	3
APE 835	E	Organisational and Institutional Ethical Values	3	0	0	3
APE 837	E	Theories of Moral Rights and Society	3	0	0	3
APE 839	E	African Philosophy and Society	3	0	0	3
APE 841	E	Theories and Issues in Ethics	3	0	0	3

SECOND SEMESTER

COMPULSORY COURSES (BIOETHICS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 828	C	Contemporary Ethical Problems in Bioscience	3	0	0	3
APE 830	C	Advanced Ethical Issues in Science and Technology	3	0	0	3
	E	Elective				6
	TOTAL					12

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 832	E	Advanced Ethics and Life Issues	3	0	0	3
APE 834	E	Intelligence Analysis and Policy Making	3	0	0	3
APE 836	E	Science and Technology Policy in Applied and Professional Ethics	3	0	0	3
APE 838	E	Public Health, Bioethics and Law	3	0	0	3
APE 840		Advanced Ethics of Technology and Engineering	3	0	0	3

THIRD SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 899	C	Dissertation	0	0	36	12
	TOTAL					12

M.Phil. in Applied Professional Ethics and Public Affairs

FIRST SEMESTER

COMPULSORY COURSES (APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 831	C	Research Methodology	3	0	0	3
APE 833	C	Nature and Principles of Applied and Professional Ethics	3	0	0	3
COM 705	C	Facilitating Online***	1	0	0	1
ESP 813	R	Advanced Writing Skills and Document Design***	2	0	0	2
	E	Elective				9
	TOTAL					

***Only for those who did not do MSc in Applied and Professional Ethics at INTEDH FUTA.

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 835	E	Organisational and Institutional Ethical Values	3	0	0	3
APE 837	E	Theories of Moral Rights and Society	3	0	0	3
APE 839	E	African Philosophy and Society	3	0	0	3
APE 841	E	Theories and Issues in Ethics	3	0	0	3
APE 845	E	Current Issues in Applied and Professional Ethics	3	0	0	3

SECOND SEMESTER

COMPULSORY COURSES (APPLIED AND PROFESSIONAL ETHICS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 830	C	Advanced Ethical Issues in Science and Technology	3	0	0	3
APE 836	C	Science and Technology Policy in Applied and Professional Ethics	3	0	0	3
	6	Electives				6
	TOTAL					

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 846	E	Advanced Ethics and Public Affairs	3	0	0	3
APE 848	E	Advanced Business Ethics	3	0	0	3
APE 850	E	Advanced Environmental Ethics	3	0	0	3
APE 840	E	Advanced Ethics of Technology and Engineering	3	0	0	3
	TOTAL					

THIRD SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 899	C	Dissertation	0	0	36	12
	TOTAL					12

M.Phil. in Security and Intelligence Studies (SIS)

FIRST SEMESTER

COMPULSORY COURSES (SECURITY AND INTELLIGENCE STUDIES)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 831	C	The Nature and Principles of Security and Intelligence Studies	3	0	0	3
APE 831	C	Research Methodology	3	0	0	3
	C	Facilitating Online***	3	0	0	3
ESP 813	R	Advanced Writing Skills and Document Design***	2	0	0	2
		Elective				9
	TOTAL					

***Only for those who did not do MSc in Security and Intelligence Studies at INTEDH FUTA

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 833	E	Advanced Philosophy of Mind	3	0	0	3
SIS 835	E	Ethics, Society & Security	3	0	0	3
APE 835	E	Organisational and Institutional Ethical Values	3	0	0	3
SIS 837		The Philosophical Foundations of Science and Technology	3	0	0	3
	TOTAL					

SECOND SEMESTER

COMPULSORY COURSES (SECURITY AND INTELLIGENCE STUDIES)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 836	C	Advanced Cybernetics and Artificial intelligence	3	0	0	3
SIS 838	C	Advanced Security and Strategic Studies	3	0	0	3
	E	Electives				6
	TOTAL					

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 830	E	Advanced Ethical Issues in Science and Technology	3	0	0	3
APE 846	E	Advanced Ethics and Public Affairs	3	0	0	3
SIS 840	E	Theories of Security	3	0	0	3
SIS 842	E	Advanced Security Ethics and Social Change	3	0	0	3
APE 840	E	Advanced Ethics of Technology and Engineering	3	0	0	3

THIRD SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 899	C	Dissertation	0	0	36	12
	TOTAL					12

Course Synopses

APE 828 Contemporary Ethical Problems in Bioscience (3 Units)
Contemporary Ethical issues and Problems in bioscience; Science, Technology, Culture and Bioscience; Ethical Issues Relating to Scientific Innovations, Inventions, Genetic Engineering, etc; Bioscience, Ethical Rights, Justice, Common good and Ethical Dilemma; Ethical Implications and Impacts of bioscience on society; Advances in In vitro fertilization (IVF), Cloning, Euthanasia, etc.

APE 829 The Nature and Principles of Bioethics (3 Units)
The nature, concerns and aims of bioethics; Definition and Problems of bioethics; Types and sub-disciplines of bioethics (Medical Ethics, Animal Ethics and Environmental Ethics); Historical background of bioethics; Theories in Bioethics (Deontological theories, Utilitarianism, Four-Principle Approach/Principlism (autonomy, beneficence, non-maleficence and justice); Moral Status and Bioethics.

APE 830 Advanced Ethical Issues in Science and Technology (3 Units)
The Nature of Science; The Nature of Scientific Truths; The Nature of Technology; The Nexus between Science and Technology; The Methods of Science and Technology; Theories and Issues in Ethics. Science, Technology and Ethical Issues; Social and Moral Determinants of Scientific and Technological Growth; Science, Technology and Ethical Values; Society, Ethical Values and Science and Technology; Codes of Ethics and Science and Technology.

APE 831 Research Methodology (3 Units)
Research Methodology; Types of Research Methods (Qualitative, Quantitative, Descriptive, Applied, Analytic, Exploratory, etc); Research Methods in the Sciences, the Humanities and the Social Sciences; Research Problems and Guidelines; Research ethics and Ethical Rules; Grants Writing, Plagiarism, etc.

APE 832 Advanced Ethics and Life Issues (3 Units)
Contemporary Issues in reproduction, reproductive health and ethics: Abortion, birth-control, cloning, in-vitro fertilization, gene editing, drugs administration, surrogacy, gender issues, etc; Modern Technology and Concerns in embryonic stem cell research, euthanasia, assisted suicide, etc. Legal matters and reproductive health; Reproductive health and Environmental, Social, Cultural and Political Matters; Business Interests and Reproductive Health.

APE 833 Advances in Bioethics (3 Units)
Bioethics and Biotechnology (Scientific and Technological Advances); Virtue and Professional Conduct; Life, Death, Suffering and Moral Dilemma in Medicine; Bioethics, Conscience and Action; Bioethics, Medical Information and Education; Organ Donations, Sales, Transplantation; Ethics and Pandemics; Medical Paternalism, Informed Consent, Medical Care; Medical Care, Laws and Medical Oaths; Medical Services and Management.

APE 834 Intelligence Analysis & Policy Making 3 Units
The Basics of Intelligence Studies: The Concepts and explanations of Intelligence; Theories of Intelligence; The Nature and Principles of Intelligence Analysis; Intelligence Analysis in Security Matters; Experimental Analysis of Trending Modes of Criminality and Violence; The Idea of Policy-making: Concepts, Theories and Methods of Policy-making; Critical Evaluation of Policy-making and Methods of Policy-making; Government and Policy making processes: the Roles of the Legislature, Judiciary and the Executive Arms of Government and the Law of Separation of Power in Policy-making in a Democratic System of Government; Non-Governmental Institutions and Policy-making; Policy-making and the Interface of the Public and the Private; Nations, Institutions and the Future of Policy-making.

APE 835 Organisational and Institutional Ethical Values (3 Units)
Organizations, Institutions, Ethics and Values; Issues in Organisational and Institutional Ethics; Professional Organisations and Policy Ethics; Public Ethics Versus Private Ethics in Organisational and Institutional Relations; Moral, Amoral and Immoral Conducts; Organisational Responses to Ethical issues; Organisational Politics, Conflicts and Morality; Moral Boundaries: Gender, Sex, Race and Discrimination; Empirical Organisational Ethics: Data Uses and Other Empirical Methods in Considerations of Ethical Challenges, Social Justice and Organisational Responses; Ethics of Organisational Management:

Education, Discipline, Sanctions and Rewards; Ethical Values and Professional Best Practices..

APE 836 Science and Technology Policies in Applied and Professional Ethics (3 Units)

The scope of Applied and Professional Ethics; Policy and Types of Policy; Science and Technology Policies; Scientific Innovations and Policies of Science and Technology; Agencies of Policy in Science and Technology: NIMET, NAFDAC, SON, CPC, NIH, etc; Applied and Professional Ethics and Science and Technology Policies in Africa; Science and Technology Policy on Education; Technology Ethics, Technology Policy and Human Development.

APE 837 Theories of Moral Rights and Society (3 Units)

The conception and evolution of the idea of Moral Rights; The Basic Rights of Man (Freedom, Justice and Equality); Theories and theorists of Human Rights (Aristotle, Thomas Aquinas, Thomas Hobbes, John Locke, J.J. Rousseau, Thomas Paine, John Rawls, etc); Critics of Moral Rights (Jeremy Bentham, Edmund Burke, Friedrich Nietzsche, Karl Marx, Alasdair McIntyre, etc); Moral Rights, Contemporary events and Societal Development.

APE 838 Public Health, Bioethics and Law

The History of Public health; The Nature of Public Health; The Principles of Public Health: Equity, Social Justice, Participation, Accessibility, Efficiency, Empowerment, Affordability, Health Protection, Health Promotion, Evidence-based Practice; Application of the Principles of Public Health; Impacts of the Application of the Principle of Public Health: on Population Health, Quality of Health-care and Social Equality; Bioethics and Public Health; Bioethics and Natural Law: Rights, Moral Values and Responsibility; Bioethics and Health Law.

APE 839 African Philosophy and Society (3 Units)

The nature and evolution of African Philosophy; Branches of African Philosophy; Trends in African Philosophy; African Philosophy in the twentieth century; The twentieth century theorists of African Philosophy (Aime Cisaire, Leopold Senghor, Kwame Nkrumah, Julius Nyerere, John Mbiti, etc); The Great Debates in African Philosophy (C.S. Momoh, Robin Horton, Henri Maurier, Peter Bodun, Kwasi Wiredu, Kwame Gyekye, Barry Halen, C.B. Okolo, Paulin Hountoundji, Odera Oruka, Sophie Oluwole, etc); African Philosophy in the Twenty-first century.

APE 840 Advanced Ethics of Technology and Engineering (3 Units)

Conceptualisation of Ethics, Technology and Engineering; The Scientific Basis and Connections between Ethics and Engineering; Ethical Theories of Engineering and Industrial Revolution; Innovations and Evolutions of Technology and Engineering Ethics; The Contributions of Agriculture, the Military, Transportation and other Factors in the Primitive, Medieval, Middle and Modern Eras to the Contemporary Development; Technology and Engineering Ethics in the Age of Information Technology; Technology and Engineering Ethics and Public Welfare; Technology and Engineering Ethics and Professional Codes of Conduct; Labour in the World of Technology and Engineering; The Future of Technology and Engineering Ethics in the Twenty First Century.

APE 841 Theories and Issues in Ethics (3 Units)

The Nature of ethics: Deontological and Consequentialist theories; Virtue and Duty theories: Plato's four virtues (wisdom, courage, temperance and justice), Aristotle's Virtues and Doctrine of the Mean, Medieveal theological virtues (faith, hope and charity), Alasdair MacIntyre's defense of the roles of virtues, Samuel Putendorf's conception of duties, John Locke's rights theory, Kant's principle of duty, W.D. Ross' prima facie duties (fidelity, reparation, gratitude, justice, beneficence, self-improvement, non-maleficence), etc; Normative and Conceptual Issues in ethics: truth telling, trustworthiness, loyalty, respect for people, obedience to laws, non-harm principle, accountability, etc.

APE 843 The Nature and Principles of Applied and Professional Ethics (3 Units)

The Nature, Concerns and Aims of Applied and Professional Ethics; Historical and Theoretical Background of Applied and Professional Ethics; Issues and Principles of Applied and Professional Ethics: Contracts, Consent, Conflict of Interests, Privacy, Confidentiality, Professional Duties, Professional Competence and Due Care, Responsibility, Accountability, Openness, Honesty, Impartiality, Professional Relationships, Professional Conduct, Professional Best Practices, etc; Aspects of Applied and Professional Ethics: Business Ethics, Leadership and Institutional Ethics, Ethics of Public Life and Media, Ethics of work, Ethics of Sports, Medical Ethics, Environmental Ethics, etc.

APE 845 Current Issues in Applied and Professional Ethics (3 Units)
Contemporary Issues in Applied and Professional Ethics: Benevolence, Beneficence, Justice, Lawfulness, Paternalism, Autonomy, Harm, Privacy, Oath-taking, Deception, Integrity, Safety, Suicide, Poverty, War, etc; Rights, Obligations and Responsibility: Moral Rights, Corporate Rights, Bodily Rights (Reproductive Rights, Anti-Slavery Rights, Right to Life, Sexual Rights); Professional Codes of Ethics; Contemporary Organisational Ethics; Corporate Theft; Professionalism, Organisational Leadership and Ethics of Institutions; Corporate Obligations, Environmental Rights and Social Ethics, Governance Ethics, Public Life and Public Service Ethics; Governance and Internet Espionage; Conflict of Interests in Health Ethics, Discrimination, Harassment, Abuse of Authority, etc; Team Ethics and Professional Practices.

APE 846 Advanced Ethics and Public Affairs (3 Units)
The Nature and Foundation of Ethics; Moral Objectivism versus Moral Subjectivism; Moral truths and Moral Dilemma in Public Affairs; Theories and Theorists of Public Affairs and Administration; Ethical issues in Public Affairs and Administration; Ethics, Social and Religious Interpretations; Freedom and Determinism; Ethical theories and Public Existence; Public Morality and Accountability; Public Life, Oath-taking, Moral Choices, Accountability and Public Affairs; Ethics and Freedom of information: Secrecy, Openness and Public Affairs; Public Operations, Public Conduct and Moral Conduct; Ethics, Diplomacy and Public Affairs; Corporate Ethics and Public Affairs; Government Ethics and Public Affairs: Civility, Public Versus Private Interest, Gifts and Bribes, Records and Activities of Elected Officials, Lobbying, Corruption, Favouritism, Nepotism, Whistle blowing, etc; Civil Service Ethics and Public Affairs: Administrative Procedures, Confidentiality, Gender Equality, Public Procurement Ethics, Administrative Law and Morality, Values and Information, etc; Ethics and Everyday Life.

APE 848 Advanced Business Ethics (3 Units)
The Nature of Business Ethics; Business Ethics and Economic Theories; Business Ethics Theories: Deontological theory, Moral Egoism, Utilitarianism, Social Contract theories, Gender theory, Norm theory, etc; The Principles of Business Ethics: Common good, Rights, Virtue Ethics, Justice, Promise-keeping, Loyalty, Fairness, Concern for others, Professional Excellence, Leadership, Reputation, Accountability, Honesty, etc; Individualism, Public Ethics and Business Ethics; Current Issues in Business Ethics; Corporate Ethics and Social Affairs; The Question of Morality in Business: Business Decisions, Business Profit and Corporate Social Responsibility; Government, Business and Society; Social Change, Business Ethics and African Development.

APE 850 Advanced Environmental Ethics (3 Units)
The Basics of Environmental Philosophy; Aspects of Environmental Philosophy: Anthropocentric Reformism, Environmental Ethics and Radical Ecology; Trends in Environmental Ethics: Justice, Sustainability, Sufficiency, Compassion, Solidarity and Participation; Environmental Ethics, Climate Change and Environmental Justice; Industrialization, Public Welfare and Public Policy; Environmental Sustainability and Trans-Generational Justice; Speciesism, Animal Rights, Eco-toxicology and Environmental Rights; Environmental Politics and Social Justice; Environmental Activism, Violent Resistance and Just Actions; Eco-feminism and Green Revolution; Environmental Racism, Green Political Theory and Environmental Governance.

APE 899 M.Phil. Thesis (12 Units)
An original investigation in an area of Bioethics or Applied and Professional Ethics, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge. The dissertation must be defended at an open oral examination organised by the School of Postgraduate Studies.

SIS 831 The Nature and Principles of Security and Intelligence Studies (3 Units)
The Nature, Concerns and Aims of Security and Intelligence Studies; Historical and Theoretical Background of Security and Intelligence Studies; Issues and Principles of Security and Intelligence Studies; Aspects of Security and Intelligence Studies; Paradigm Shifts in Security and Intelligence Studies; Violence, Crime Control and Intelligence Analysis; Intelligence and Espionage; Insurgency and Counter-Insurgency; Global Insurgencies; Ethics of Counter-Insurgency; Counter-Intelligence and Intelligence Network; Cyberspace and Security and Intelligence Studies; Intelligence Education and the World; Academia and Security: Intellectual writing, punditry and security journalism; The Multi-disciplinary Lenses of Security and Intelligence Studies;

Evolutionary logic and Security and Intelligence Studies; Intelligence Gathering; Principles of Intelligence Gathering.

SIS 833 Advanced Philosophy of Mind (3 Units)
History of the Philosophy of Mind; Nature and Conceptions of the Mind: Subjectivity and Objectivity; Intentionality and Consciousness; Belief and Reason; The Will; the Mind-Body Problem/Mind-Brain Duality: Monism, Dualism, Reductive Materialism; Physicalism and Materialism: Identity theory, Epiphenomenalism, Parallelism, Occasionalism, etc; Functionalism; Advances in the Philosophy of Mind.

SIS 835 Ethics, Society and Security (3 Units)
Ethics and Society; Ethics and Security; Just Actions, Society and Security; Human Nature, Moral Values and Societal Order; Moral Order and Social Values; Public Morality and Corruption in Social Life; Crime, Punishment and the Social Order Ethics, Traditional Institutions and Security; Security and Social Issues in Information Technology; Social, Environmental and Political Problems and Security; Gender Conflicts and Security; Ethics, Security and Human Development.

SIS 836 Advanced Cybernetics and Artificial Intelligence (3 Units)
Concepts, theories and issues in Cybernetics and Artificial Intelligence; Early History of Cybernetics: Plato to the Nineteenth Century; Later History of Cybernetics: Twentieth and Twenty-first Century; Principles and methods of Cybernetics and Artificial Intelligence; Artificial Systems and Natural Systems; The Philosophy of Cybernetics and Artificial Intelligence; Philosophical Problems and Cybernetics and Artificial Intelligence; Mind and Consciousness; Machine Ethics/The Ethics of Artificial Intelligence; Cybernetics, Artificial Intelligence and Society; Cybernetics, Artificial Intelligence and Human Rights; Artificial Intelligence and Everyday Existence.

SIS 837 The Philosophical Foundations of Science and Technology (3 Units)
The philosophical basis of science and technology; The nature of the universe: Ancient and Modern Perspectives on Materialism and Idealism; Epistemology, logic, ethics, metaphysics and aesthetics and the status of scientific knowledge; Philosophers of Science and Technology and the Criteria of Scientific Knowledge: Logical Positivism and the Verifiability Criterion, Popper's Falsification theory, epistemological anarchism, etc; Normal Science; Paradigms and paradigm shifts; Scientific revolution; analytic knowledge versus synthetic knowledge: apriori versus aposterori truths; Qualitative and quantitative laws, causality: causal laws, determinism, freewill; Existentialism and Phenomenology, Pragmatism; Science, Technology and Cognition; The character of Scientific statements, laws and explanations: Scientific laws, universal laws, statistical laws, empirical laws, theoretical laws, laws of logic; the nature of scientific method: Induction and deduction and the objectivity of science; observation and experimental method.

SIS 838 Advanced Security and Strategic Studies (3 Units)
Theoretical and Conceptual Issues in Security Studies; Advances in Security and Strategic Studies; Dimensions of Security; Dynamics of Security; Public and Private Sector Security; Security and Management of Technology; Security and Cyber war; International Security and International Diplomacy; International Policing, Crime and Anti-crime Policies; Domestic Security and National Values; Transcontinental threats to Security: Violence, Coercion, Terrorism; Deterrence, Social Action and Defence; The future of International Security.

SIS 840 Theories of Security (3 Units)
Basic theories in Security; Scientific Approach to the concept of Security: objectivity, subjectivity and symbolism; Causality: Risk theory, Crisis theory and Safety theory; Internal and external theories of National Security; Human Security: Traditional Security theory, Emancipatory theories, feminist theory, etc; Dimensions and Components of Human Security theory; Political Theories of Security: The Social Contract, Securitisation theory; Securitization and separatism; Military Theories of security; Welfare and Economic theories of security: imperialism, capitalism, communism, Westphalianism; neoliberalism, etc.

SIS 842 Advanced Security Ethics and Social Change (3 Units)
The idea of Security; Different Aspects of Security; Contemporary Issues in Security Studies; Issues in the

Social Change Discourse; Theories and Concepts of Social Change; Conceptualising Security Ethics; Security Ethics and Social Change; Ethics, Security and Human Challenges; Security and Societal Development; Social Order and Social Change; Security Ethics, Moral Change and Social Change; Morality, Global Security and Social Change; Ethics, Security Ethics and National Affairs; Transnational Implications of Domestic Security Problems; Global Economy and Security Affairs; Ethics and Global Determinants of Social Peace.

SIS 899 M.Phil/PhD Thesis (12 Units)
An original investigation in any area of Security and Intelligence Studies, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge. The dissertation must be defended at an open oral examination organised by the School of Postgraduate Studies.

POST GRADUATE PROGRAMME IN BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUB LIC AFFAIRS, AND SECURITY AND INTELLIGENCE STUDIES (M.Phil/PhD in Bioethics, APE and SIS)

1. POSTGRADUATE PROGRAMMES OPTIONS

The programmes offer M.Phil/Ph.D courses as stipulated below:

M.Phil/Ph.D in:

a. Bioethics (Bioethics)
b. Applied Professional Ethics and Public Affairs (APE)
c. Security and Intelligence Studies (SIS)

2. PROGRAMME PHILOSOPHY

The Institute of Technology-Enhanced Learning and Digital Humanities (INTEDH) is committed to a higher education environment and technology-based knowledge impartation through purposeful learning and teaching. The M.Phil/Ph.D programmes in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies aim at helping researchers/academics, leaders, personnel, security agents, policy and decision-makers, in various sectors of life such as government, civil service, education, business, medical practice, military and paramilitary agencies to update their professional and academic knowledge, through technology-integrated (blended) learning, by providing them with empirical and theoretical backgrounds in dealing with the ethical aspects of professional and societal problems. Thus, the courses which are undergirded by relevant theories introduce students to learner-centred approach to Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies and are enriched with strong emphases on contemporary technological skills.

3. PROGRAMME OBJECTIVES

These programmes are designed to:

(a) Train students to acquire necessary research skills and gain the theoretical and procedural knowledge for critical thinking and analysis in their fields.
(b) Train researchers, business leaders, personnel, career officers, and policy formulators to have in-depth knowledge of the theory and application of ethics through technology-assisted learning;
(c) Train experts and professionals who can combine sound technical and theoretical knowledge with sophisticated practical skills in meeting Nigeria's contemporary developmental needs.
(d) Equip professionals in multinationals, governmental and nongovernmental organisations who can utilise requisite technologies in 21st century skills workplace.
(e) Equip institutional, medical, military and paramilitary personnel to gain in-depth knowledge of the different ethical issues relating to their fields of specialisation through the application of the relevant tools of information technology.

4. PROGRAMME JUSTIFCATION

The M.Phil/Ph.D programmes in Bioethics, Applied Professional Ethics and Public Affairs, Security and Intelligence Studies are relevant in contemporary times when issues on ethics and security have become a global challenge. Students who successfully graduate

from the programmes will be adequately equipped with twenty-first century research and technology-assisted skills and competencies necessary to enhance their careers as professionals. Giving opportunity for further research studies, the programmes will:

i. Meet the research needs of students and prepare them for the acquisition of independent researches skills that will enhance their abilities to proceed to the Doctor of Philosophy (Ph.D.) programme.
ii. Train professionals and decision-makers in various sectors of life, such as government, civil service, education, business, medical practice, military and paramilitary agencies to become specialised in their fields and professions.
iii. Train career officers to have good ethical backgrounds of issues in their fields.
iv. Make students gain in-depth knowledge and awareness of important moral, socio-political, cultural and professional issues and information in everyday events

5. ADMISSION REQUIREMENTS

Academic requirements for admission into the M.Phil/Ph.D degrees in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies:

i. M.Phil/Ph.D candidates must have scored between 55% and 59% or 3.0 – 3.49 on a 5 point scale at the Master's degree programme.

6. PROGAMMES' DURATION

b. M.Phil/Ph.D

i. Full-time: 12-18 months

7. GRADUATION REQUIREMENTS

II. M.Phil/Ph.D, in:

i. Bioethics,
ii. Applied Professional Ethics and Public Affairs,
iii. Security and Intelligence Studies

To qualify for the award of the M.Phil/Ph.D in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies, the requirements for graduation for any candidate who could not successfully convert to Ph.D programme shall be as follows:

i. Candidate must have passed a minimum of 24 course units including 12 units of an independent research thesis and attain at least a pass mark of 50% in every course offered.
ii. Candidate must have successfully presented two seminar papers (proposal and progress seminars) and passed all prescribed courses.
iii. Candidate must have successfully completed and defended the research thesis in/at oral examination.
iv. To be eligible to proceed to Ph.D, the candidate must have scored an average of 60% or a minimum of 3.50 and above on a 5 point grading scale.
v. The candidate who does not satisfy the requirement to proceed to Ph.D, will be awarded a terminal degree of M.Phil after successfully:
   a. Passing all courses prescribed by INTEDH with a minimum score of 50% in each course.
   b. Presenting at least 2 seminars papers (at proposal and progress report seminar levels) on a topic approved by the School of Postgraduate Studies Advisory Committee.
   c. Completing the registration of thesis title in line with the regulations of the School of Postgraduate Studies.
   d. Successfully defending a research thesis at an oral examination organized by the School of Postgraduate studies.
   e. Satisfying other conditions prescribed by the School of Postgraduate Studies for the award of M.Phil.

REQUIREMENTS FOR CONVERSION FROM M.Phil/Ph.D. TO Ph.D.

To convert from M. Phil. a candidate must have successfully:

i. Presented at least two seminar papers (at proposal and progress seminar levels).
ii. Prepared and submitted a research plan considered suitable for pursuing a Ph.D. degree to the Postgraduate School through INTEDH.
iii. Presented a detailed report of research-work done up to the time of seeking conversion and submitted to the School of Postgraduate Studies

any relevant published and unpublished materials that can be assessed by INTEDH.

iv. Completed all course works with a CGPA of not less than 3.5 or 60% aggregate score in the M.Phil. programme.
v. Passed an oral transfer examination to be conducted by a panel drawn from INTEDH on the subject of the research undertaken and related topics to the candidate's field of study.
vi. Fulfilled all other conditions approved by the University Senate.
vii. Candidate must obtain and complete a Ph.D Conversion Form as appropriate.

8. COURSE OUTLINE

M.Phil./Ph.D. IN BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS, AND SECURITY AND INTELLIGENCE STUDIES

M.Phil/PhD in Bioethics

FIRST SEMESTER

COMPULSORY COURSES (BIOETHICS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 829	C	The Nature and Principles of Bioethics	3	0	0	3
APE 831	C	Research Methodology	3	0	0	3
COM 705	C	Facilitating Online***	1	0	0	1
ESP 813	R	Advanced Writing Skills and Document Design***	2	0	0	2
	E	Elective				6
	TOTAL					15

***Only for those who did not do MSc in Bioethics at INTEDH FUTA

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 833	E	Advances in Bioethics	3	0	0	3
APE 835	E	Organisational and Institutional Ethical Values	3	0	0	3
APE 837	E	Theories of Moral Rights and Society	3	0	0	3
APE 839	E	African Philosophy and Society	3	0	0	3
APE 841	E	Theories and Issues in Ethics	3	0	0	3

SECOND SEMESTER

COMPULSORY COURSES (BIOETHICS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 828	C	Contemporary Ethical Problems in Bioscience	3	0	0	3
APE 830	C	Advanced Ethical Issues in Science and Technology	3	0	0	3
	E	Elective				6
	TOTAL					12

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 832	E	Advanced Ethics and Life Issues	3	0	0	3
APE 834	E	Intelligence Analysis and Policy Making	3	0	0	3
APE 836	E	Science and Technology Policy in Applied and Professional Ethics	3	0	0	3
APE 838	E	Public Health, Bioethics and Law	3	0	0	3
APE 840		Advanced Ethics of Technology and Engineering	3	0	0	3

THIRD SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 899	C	Dissertation	0	0	36	12
	TOTAL					12

M.Phil/PhD in Applied Professional Ethics and Public Affairs

FIRST SEMESTER

COMPULSORY COURSES (APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 831	C	Research Methodology	3	0	0	3
APE 833	C	Nature and Principles of Applied and Professional Ethics	3	0	0	3
COM 705	C	Facilitating Online***	1	0	0	1
ESP 813	R	Advanced Writing Skills and Document Design***	2	0	0	2
	E	Elective				6
	TOTAL					

***Only for those who did not do MSc in Applied Professional Ethics and Public Affairs at INTEDH FUTA.

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 835	E	Organisational and Institutional Ethical Values	3	0	0	3
APE 837	E	Theories of Moral Rights and Society	3	0	0	3
APE 839	E	African Philosophy and Society	3	0	0	3
APE 841	E	Theories and Issues in Ethics	3	0	0	3
APE 845	E	Current Issues in Applied and Professional Ethics	3	0	0	3

SECOND SEMESTER

COMPULSORY COURSES (APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 830	C	Advanced Ethical Issues in Science and Technology	3	0	0	3
APE 836	C	Science and Technology Policy in Applied and Professional Ethics	3	0	0	3
	6	Electives				6
	TOTAL					

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 846	E	Advanced Ethics and Public Affairs	3	0	0	3
APE 848	E	Advanced Business Ethics	3	0	0	3
APE 850	E	Advanced Environmental Ethics	3	0	0	3
APE 840	E	Advanced Ethics of Technology and Engineering	3	0	0	3
	TOTAL					

THIRD SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 899	C	Dissertation	0	0	36	12
	TOTAL					12

M.Phil, M.Phil/PhD in Security and Intelligence Studies (SIS)

FIRST SEMESTER

COMPULSORY COURSES (SECURITY AND INTELLIGENCE STUDIES)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 831	C	The Nature and Principles of Security and Intelligence Studies	3	0	0	3
APE 831	C	Research Methodology	3	0	0	3
COM 705	C	Facilitating Online***	3	0	0	3
ESP 813	R	Advanced Writing Skills and Document Design***	2	0	0	2
		Elective				6
	TOTAL					

***Only for those who did not do MSc in Security and Intelligence Studies at INTEDH FUTA

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 833	E	Advanced Philosophy of Mind	3	0	0	3
SIS 835	E	Ethics, Society & Security	3	0	0	3
APE 835	E	Organisational and Institutional Ethical Values	3	0	0	3
SIS 837		The Philosophical Foundations of Science and Technology	3	0	0	3
	TOTAL					

SECOND SEMESTER

COMPULSORY COURSES (SECURITY AND INTELLIGENCE STUDIES)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 836	C	Advanced Cybernetics and Artificial intelligence	3	0	0	3
SIS 838	C	Advanced Security and Strategic Studies	3	0	0	3
						6
	TOTAL					

ELECTIVES

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
APE 830	E	Advanced Ethical Issues in Science and Technology	3	0	0	3
APE 846	E	Advanced Ethics and Public Affairs	3	0	0	3
SIS 840	E	Theories of Security	3	0	0	3
SIS 842	E	Advanced Security Ethics and Social Change	3	0	0	3
APE 840	E	Advanced Ethics of Technology and Engineering	3	0	0	3

THIRD SEMESTER

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
SIS 899	C	Dissertation	0	0	36	12
	TOTAL					12

Course Synopses

APE 828 Contemporary Ethical Problems in Bioscience (3 Units)
Contemporary Ethical issues and Problems in bioscience; Science, Technology, Culture and Bioscience; Ethical Issues Relating to Scientific Innovations, Inventions, Genetic Engineering, etc; Bioscience, Ethical Rights, Justice, Common good and Ethical Dilemma; Ethical Implications and Impacts of bioscience on society; Advances in In vitro fertilization (IVF), Cloning, Euthanasia, etc.

APE 829 The Nature and Principles of Bioethics (3 Units)
The nature, concerns and aims of bioethics; Definition and Problems of bioethics; Types and sub-disciplines of bioethics (Medical Ethics, Animal Ethics and Environmental Ethics); Historical background of bioethics; Theories in Bioethics (Deontological theories, Utilitarianism, Four-Principle Approach/Principlism (autonomy, beneficence, non-maleficence and justice); Moral Status and Bioethics.

APE 830 Advanced Ethical Issues in Science and Technology (3 Units)
The Nature of Science; The Nature of Scientific Truths; The Nature of Technology; The Nexus between Science and Technology; The Methods of Science and Technology; Theories and Issues in Ethics. Science, Technology and Ethical Issues; Social and Moral Determinants of Scientific and Technological Growth; Science, Technology and Ethical Values; Society, Ethical Values and Science and Technology; Codes of Ethics and Science and Technology.

APE 831 Research Methodology (3 Units)
Research Methodology; Types of Research Methods (Qualitative, Quantitative, Descriptive, Applied, Analytic, Exploratory, etc); Research Methods in the Sciences, the Humanities and the Social Sciences; Research Problems and Guidelines; Research ethics and Ethical Rules; Grants Writing, Plagiarism, etc.

APE 832 Advanced Ethics and Life Issues (3 Units)
Contemporary Issues in reproduction, reproductive health and ethics: Abortion, birth-control, cloning, in-vitro fertilization, gene editing, drugs administration, surrogacy, gender issues, etc; Modern Technology and Concerns in embryonic stem cell research, euthanasia, assisted suicide, etc. Legal matters and reproductive health; Reproductive health and Environmental, Social, Cultural and Political Matters; Business Interests and Reproductive Health.

APE 833 Advances in Bioethics (3 Units)
Bioethics and Biotechnology (Scientific and Technological Advances); Virtue and Professional Conduct; Life, Death, Suffering and Moral Dilemma in Medicine; Bioethics, Conscience and Action; Bioethics, Medical Information and Education; Organ Donations, Sales, Transplantation; Ethics and Pandemics; Medical Paternalism, Informed Consent, Medical Care; Medical Care, Laws and Medical Oaths; Medical Services and Management.

APE 834 Intelligence Analysis & Policy Making 3 Units
The Basics of Intelligence Studies: The Concepts and explanations of Intelligence; Theories of Intelligence; The Nature and Principles of Intelligence Analysis; Intelligence Analysis in Security Matters; Experimental Analysis of Trending Modes of Criminality and Violence; The Idea of Policy-making: Concepts, Theories and Methods of Policy-making; Critical Evaluation of Policy-making and Methods of Policy-making; Government and Policy making processes: the Roles of the Legislature, Judiciary and the Executive Arms of Government and the Law of Separation of Power in Policy-making in a Democratic System of Government; Non-Governmental Institutions and Policy-making; Policy-making and the Interface of the Public and the Private; Nations, Institutions and the Future of Policy-making.

APE 835 Organisational and Institutional Ethical Values (3 Units)
Organizations, Institutions, Ethics and Values; Issues in Organisational and Institutional Ethics; Professional Organisations and Policy Ethics; Public Ethics Versus Private Ethics in Organisational and Institutional Relations; Moral, Amoral and Immoral Conducts; Organisational Responses to Ethical issues; Organisational Politics, Conflicts and Morality; Moral Boundaries: Gender, Sex, Race and Discrimination; Empirical Organisational Ethics: Data Uses and Other Empirical Methods in Considerations of Ethical Challenges, Social Justice and Organisational Responses; Ethics of Organisational Management: Education, Discipline, Sanctions and Rewards; Ethical Values and Professional Best Practices..

APE 836 Science and Technology Policies in Applied and Professional Ethics (3 Units)
The scope of Applied and Professional Ethics; Policy and Types of Policy; Science and Technology Policies;

Scientific Innovations and Policies of Science and Technology; Agencies of Policy in Science and Technology: NIMET, NAFDAC, SON, CPC, NIH, etc; Applied and Professional Ethics and Science and Technology Policies in Africa; Science and Technology Policy on Education; Technology Ethics, Technology Policy and Human Development.

APE 837 Theories of Moral Rights and Society (3 Units)
The conception and evolution of the idea of Moral Rights; The Basic Rights of Man (Freedom, Justice and Equality); Theories and theorists of Human Rights (Aristotle, Thomas Aquinas, Thomas Hobbes, John Locke, J.J. Rousseau, Thomas Paine, John Rawls, etc); Critics of Moral Rights (Jeremy Bentham, Edmund Burke, Friedrich Nietzsche, Karl Marx, Alasdair McIntyre, etc); Moral Rights, Contemporary events and Societal Development.

APE 838 Public Health, Bioethics and Law (3 Units)
The History of Public health; The Nature of Public Health; The Principles of Public Health: Equity, Social Justice, Participation, Accessibility, Efficiency, Empowerment, Affordability, Health Protection, Health Promotion, Evidence-based Practice; Application of the Principles of Public Health; Impacts of the Application of the Principle of Public Health: on Population Health, Quality of Health-care and Social Equality; Bioethics and Public Health; Bioethics and Natural Law: Rights, Moral Values and Responsibility; Bioethics and Health Law.

APE 839 African Philosophy and Society (3 Units)
The nature and evolution of African Philosophy; Branches of African Philosophy; Trends in African Philosophy; African Philosophy in the twentieth century; The twentieth century theorists of African Philosophy (Aime Cisaire, Leopold Senghor, Kwame Nkrumah, Julius Nyerere, John Mbiti, etc); The Great Debates in African Philosophy (C.S. Momoh, Robin Horton, Henri Maurier, Peter Bodun, Kwasi Wiredu, Kwame Gyekye, Barry Halen, C.B. Okolo, Paulin Hountoundji, Odera Oruka, Sophie Oluwole, etc); African Philosophy in the Twenty-first century.

APE 840 Advanced Ethics of Technology and Engineering (3 Units)
Conceptualisation of Ethics, Technology and Engineering; The Scientific Basis and Connections between Ethics and Engineering; Ethical Theories of Engineering and Industrial Revolution; Innovations and Evolutions of Technology and Engineering Ethics; The Contributions of Agriculture, the Military, Transportation and other Factors in the Primitive, Medieval, Middle and Modern Eras to the Contemporary Development; Technology and Engineering Ethics in the Age of Information Technology; Technology and Engineering Ethics and Public Welfare; Technology and Engineering Ethics and Professional Codes of Conduct; Labour in the World of Technology and Engineering; The Future of Technology and Engineering Ethics in the Twenty First Century.

APE 841 Theories and Issues in Ethics (3 Units)
The Nature of ethics: Deontological and Consequentialist theories; Virtue and Duty theories: Plato's four virtues (wisdom, courage, temperance and justice), Aristotle's Virtues and Doctrine of the Mean, Medieveal theological virtues (faith, hope and charity), Alasdair MacIntyre's defense of the roles of virtues, Samuel Putendorf's conception of duties, John Locke's rights theory, Kant's principle of duty, W.D. Ross' prima facie duties (fidelity, reparation, gratitude, justice, beneficence, self-improvement, non-maleficence), etc; Normative and Conceptual Issues in ethics: truth telling, trustworthiness, loyalty, respect for people, obedience to laws, non-harm principle, accountability, etc.

APE 843 The Nature and Principles of Applied and Professional Ethics (3 Units)
The Nature, Concerns and Aims of Applied and Professional Ethics; Historical and Theoretical Background of Applied and Professional Ethics; Issues and Principles of Applied and Professional Ethics: Contracts, Consent, Conflict of Interests, Privacy, Confidentiality, Professional Duties, Professional Competence and Due Care, Responsibility, Accountability, Openness, Honesty, Impartiality, Professional Relationships, Professional Conduct, Professional Best Practices, etc; Aspects of Applied and Professional Ethics: Business Ethics, Leadership and Institutional Ethics, Ethics of Public Life and Media, Ethics of work, Ethics of Sports, Medical Ethics, Environmental Ethics, etc.

APE 845 Current Issues in Applied and Professional Ethics (3 Units)
Contemporary Issues in Applied and Professional Ethics: Benevolence, Beneficence, Justice, Lawfulness, Paternalism, Autonomy, Harm, Privacy, Oath-taking, Deception, Integrity, Safety, Suicide, Poverty, War, etc; Rights, Obligations and Responsibility: Moral Rights, Corporate Rights, Bodily Rights (Reproductive Rights, Anti-Slavery Rights, Right to Life, Sexual Rights); Professional Codes of Ethics; Contemporary Organisational Ethics; Corporate Theft; Professionalism, Organisational Leadership and Ethics of Institutions; Corporate Obligations, Environmental Rights and Social Ethics,

Governance Ethics, Public Life and Public Service Ethics; Governance and Internet Espionage; Conflict of Interests in Health Ethics, Discrimination, Harassment, Abuse of Authority, etc; Team Ethics and Professional Practices.

APE 846 Advanced Ethics and Public Affairs (3 Units)
The Nature and Foundation of Ethics; Moral Objectivism versus Moral Subjectivism; Moral truths and Moral Dilemma in Public Affairs; Theories and Theorists of Public Affairs and Administration; Ethical issues in Public Affairs and Administration; Ethics, Social and Religious Interpretations; Freedom and Determinism; Ethical theories and Public Existence; Public Morality and Accountability; Public Life, Oath-taking, Moral Choices, Accountability and Public Affairs; Ethics and Freedom of information: Secrecy, Openness and Public Affairs; Public Operations, Public Conduct and Moral Conduct; Ethics, Diplomacy and Public Affairs; Corporate Ethics and Public Affairs; Government Ethics and Public Affairs: Civility, Public Versus Private Interest, Gifts and Bribes, Records and Activities of Elected Officials, Lobbying, Corruption, Favouritism, Nepotism, Whistle blowing, etc; Civil Service Ethics and Public Affairs: Administrative Procedures, Confidentiality, Gender Equality, Public Procurement Ethics, Administrative Law and Morality, Values and Information, etc; Ethics and Everyday Life.

APE 848 Advanced Business Ethics (3 Units)
The Nature of Business Ethics; Business Ethics and Economic Theories; Business Ethics Theories: Deontological theory, Moral Egoism, Utilitarianism, Social Contract theories, Gender theory, Norm theory, etc; The Principles of Business Ethics: Common good, Rights, Virtue Ethics, Justice, Promise-keeping, Loyalty, Fairness, Concern for others, Professional Excellence, Leadership, Reputation, Accountability, Honesty, etc; Individualism, Public Ethics and Business Ethics; Current Issues in Business Ethics; Corporate Ethics and Social Affairs; The Question of Morality in Business: Business Decisions, Business Profit and Corporate Social Responsibility; Government, Business and Society; Social Change, Business Ethics and African Development.

APE 850 Advanced Environmental Ethics (3 Units)
The Basics of Environmental Philosophy; Aspects of Environmental Philosophy: Anthropocentric Reformism, Environmental Ethics and Radical Ecology; Trends in Environmental Ethics: Justice, Sustainability, Sufficiency, Compassion, Solidarity and Participation; Environmental Ethics, Climate Change and Environmental Justice; Industrialization, Public Welfare and Public Policy; Environmental Sustainability and Trans-Generational Justice; Speciesism, Animal Rights, Eco-toxicology and Environmental Rights; Environmental Politics and Social Justice; Environmental Activism, Violent Resistance and Just Actions; Eco-feminism and Green Revolution; Environmental Racism, Green Political Theory and Environmental Governance.

APE 899 M.Phil. Thesis (12 Units)
An original investigation in an area of Bioethics or Applied and Professional Ethics, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge. The dissertation must be defended at an open oral examination organised by the School of Postgraduate Studies.

SIS 831 The Nature and Principles of Security and Intelligence Studies (3 Units)
The Nature, Concerns and Aims of Security and Intelligence Studies; Historical and Theoretical Background of Security and Intelligence Studies; Issues and Principles of Security and Intelligence Studies; Aspects of Security and Intelligence Studies; Paradigm Shifts in Security and Intelligence Studies; Violence, Crime Control and Intelligence Analysis; Intelligence and Espionage; Insurgency and Counter-Insurgency; Global Insurgencies; Ethics of Counter-Insurgency; Counter-Intelligence and Intelligence Network; Cyberspace and Security and Intelligence Studies; Intelligence Education and the World; Academia and Security: Intellectual writing, punditry and security journalism; The Multi-disciplinary Lenses of Security and Intelligence Studies; Evolutionary logic and Security and Intelligence Studies; Intelligence Gathering; Principles of Intelligence Gathering.

SIS 833 Advanced Philosophy of Mind (3 Units)
History of the Philosophy of Mind; Nature and Conceptions of the Mind: Subjectivity and Objectivity; Intentionality and Consciousness; Belief and Reason; The Will; the Mind-Body Problem/Mind-Brain Duality: Monism, Dualism, Reductive Materialism; Physicalism and Materialism: Identity theory, Epiphenomenalism, Parallelism, Occasionalism, etc; Functionalism; Advances in the Philosophy of Mind.

SIS 835 Ethics, Society and Security (3 Units)
Ethics and Society; Ethics and Security; Just Actions, Society and Security; Human Nature, Moral Values and Societal Order; Moral Order and Social Values; Public Morality and Corruption in Social Life; Crime, Punishment and the Social Order Ethics, Traditional Institutions and Security; Security and Social Issues in Information

Technology; Social, Environmental and Political Problems and Security; Gender Conflicts and Security; Ethics, Security and Human Development.

SIS 836 Advanced Cybernetics and Artificial Intelligence (3 Units)
Concepts, theories and issues in Cybernetics and Artificial Intelligence; Early History of Cybernetics: Plato to the Nineteenth Century; Later History of Cybernetics: Twentieth and Twenty-first Century; Principles and methods of Cybernetics and Artificial Intelligence; Artificial Systems and Natural Systems; The Philosophy of Cybernetics and Artificial Intelligence; Philosophical Problems and Cybernetics and Artificial Intelligence; Mind and Consciousness; Machine Ethics/The Ethics of Artificial Intelligence; Cybernetics, Artificial Intelligence and Society; Cybernetics, Artificial Intelligence and Human Rights; Artificial Intelligence and Everyday Existence.

SIS 837 The Philosophical Foundations of Science and Technology (3 Units)
The philosophical basis of science and technology; The nature of the universe: Ancient and Modern Perspectives on Materialism and Idealism; Epistemology, logic, ethics, metaphysics and aesthetics and the status of scientific knowledge; Philosophers of Science and Technology and the Criteria of Scientific Knowledge: Logical Positivism and the Verifiability Criterion, Popper's Falsification theory, epistemological anarchism, etc; Normal Science; Paradigms and paradigm shifts; Scientific revolution; analytic knowledge versus synthetic knowledge: apriori versus aposterori truths; Qualitative and quantitative laws, causality: causal laws, determinism, freewill; Existentialism and Phenomenology, Pragmatism; Science, Technology and Cognition; The character of Scientific statements, laws and explanations: Scientific laws, universal laws, statistical laws, empirical laws, theoretical laws, laws of logic; the nature of scientific method: Induction and deduction and the objectivity of science; observation and experimental method.

SIS 838 Advanced Security and Strategic Studies (3 Units)
Theoretical and Conceptual Issues in Security Studies; Advances in Security and Strategic Studies; Dimensions of Security; Dynamics of Security; Public and Private Sector Security; Security and Management of Technology; Security and Cyber war; International Security and International Diplomacy; International Policing, Crime and Anti-crime Policies; Domestic Security and National Values; Transcontinental threats to Security: Violence, Coercion, Terrorism; Deterrence, Social Action and Defence; The future of International Security.

SIS 840 Theories of Security (3 Units)
Basic theories in Security; Scientific Approach to the concept of Security: objectivity, subjectivity and symbolism; Causality: Risk theory, Crisis theory and Safety theory; Internal and external theories of National Security; Human Security: Traditional Security theory, Emancipatory theories, feminist theory, etc; Dimensions and Components of Human Security theory; Political Theories of Security: The Social Contract, Securitisation theory; Securitization and separatism; Military Theories of security; Welfare and Economic theories of security: imperialism, capitalism, communism, Westphalianism; neoliberalism, etc.

SIS 842 Advanced Security Ethics and Social Change (3 Units)
The idea of Security; Different Aspects of Security; Contemporary Issues in Security Studies; Issues in the Social Change Discourse; Theories and Concepts of Social Change; Conceptualising Security Ethics; Security Ethics and Social Change; Ethics, Security and Human Challenges; Security and Societal Development; Social Order and Social Change; Security Ethics, Moral Change and Social Change; Morality, Global Security and Social Change; Ethics, Security Ethics and National Affairs; Transnational Implications of Domestic Security Problems; Global Economy and Security Affairs; Ethics and Global Determinants of Social Peace.

SIS 899 M.Phil/PhD Thesis (12 Units)
An original investigation in any area of Security and Intelligence Studies, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge. The dissertation must be defended at an open oral examination organised by the School of Postgraduate Studies.

POST GRADUATE PROGRAMME IN BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS, AND SECURITY AND INTELLIGENCE STUDIES

(PhD Bioethics, PhD APE and PhD SIS)

1. POSTGRADUATE PROGRAMMES OPTIONS

The programmes offer PhD courses as stipulated below:

PhD in:

a. Bioethics (PhD Bioethics)
b. Applied Professional Ethics and Public Affairs (PhD APE)
c. Security and Intelligence Studies (PhD SIS)

2. PROGRAMME PHILOSOPHY

The Institute of Technology-Enhanced Learning and Digital Humanities (INTEDH) is committed to a higher education environment and technology-based knowledge impartation through purposeful learning and teaching. The Ph.D programmes in Bioethics, Applied and Professional Ethics and Public Affairs, and Security and Intelligence Studies aim at helping researchers/academics, leaders, personnel, security agents, policy and decision-makers, in various sectors of life such as government, civil service, education, business, medical practice, military and paramilitary agencies to update their professional and academic knowledge, through technology-integrated (blended) learning, by providing them with empirical and theoretical backgrounds in dealing with the ethical aspects of professional and societal problems. Thus, the courses which are undergirded by relevant theories introduce students to learner-centred approach to Bioethics, Applied and Professional Ethics and Public Affairs, and Security and Intelligence Studies enriched with strong emphases on contemporary technological skills.

3. PROGRAMME OBJECTIVES

These programmes are designed to:

(a) Train researchers, business leaders, personnel, career officers, and policy formulators to have in-depth knowledge of the theory and application of ethics through technology-assisted learning;
(b) Train experts and professionals who can combine sound technical and theoretical knowledge with sophisticated practical skills in meeting Nigeria's contemporary developmental needs.
(c) Equip professionals in multinationals, governmental and nongovernmental organisations who can utilise requisite technologies in 21st century skills workplace.
(d) Equip institutional, medical, military and paramilitary personnel to gain in-depth knowledge of the different ethical issues relating to their fields of specialisation through the application of the relevant tools of information technology.

4. PROGRAMME JUSTIFCATION

The Ph.D programmes in Bioethics, Applied and Professional Ethics and Public Affairs, and Security and Intelligence Studies are relevant in contemporary times when issues on ethics and security have become a global challenge. Students who successfully graduate from the programme will be adequately equipped with twenty-first century research and technology-assisted skills and competencies necessary to enhance their careers as professionals. Giving opportunity for further research studies, the programmes will:

i. Train professionals and decision-makers in various sectors of life, such as government, civil service, education, business, medical practice, military and paramilitary agencies to become specialised in their fields and professions.
ii. Train career officers to have good ethical backgrounds of issues in their fields.
iii. Make students gain in-depth knowledge and awareness of important moral, socio-political, cultural and professional issues and information in everyday events

5. ADMISSION REQUIREMENTS

Academic requirements for admission into the Ph.D degree in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies include:

i. Being holders of a Master's degree in Philosophy, Bioethics, Applied Professional Ethics and Public Affairs, Security and Intelligence Studies, Public Administration, and

other related disciplines from any recognized University.

ii. Possessing a minimum score of 60% in the thesis as well as in the overall result or CGPA of 3.5 on a 5 point scale.

iii. If an M.Phil or M.Phil/Ph.D candidate, s/he must have satisfied all conditions prescribed by the School of Postgraduate Studies for candidates' eligibility to proceed to P.hD.

6. PROGAMMES' DURATION

a. PhD:

i. Full-time: 36-48 months

ii. Part-time: 48-60 months

7. GRADUATION REQUIREMENTS

To qualify for PhD in Bioethics, Applied Professional Ethics and Public Affairs, and Security and Intelligence Studies, a candidate must have:

i. Successfully completed all prescribed course works,

ii. Presented four (4) departmental project research seminars

iii. Successfully defend his PhD thesis at an oral examination organised by the School of Postgraduate Studies.

Note: Candidates who did not do Master's at INTEDH FUTA will be required to audit and pass at least 12 credit units of course work per semester, totaling 24 units, with M.Sc. students. Candidate who did not previously do Facilitating Online (COM 705) will also be required to audit it.

8. COURSE OUTLINE

DOCTOR OF PHILOSOPHY IN BIOETHICS, APPLIED PROFESSIONAL ETHICS AND PUBLIC AFFAIRS, AND SECURITY AND INTELLIGENCE STUDIES

Doctor of Philosophy in Bioethics

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
COM 705	Audited	Facilitating Online	0	0	3	1
APE 999	C	Dissertation	0	0	36	12
	TOTAL					13

APE 999 Doctoral Thesis 12 Units

An original investigation in an area of Bioethics, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge. The dissertation must be defended at an open oral examination organised by the School of Postgraduate Studies.

Doctor of Philosophy in Applied and Professional Ethics and Public Affairs (APE)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
COM 705	Audited	Facilitating Online	0	0	3	1
APE 999	C	Dissertation	0	0	36	12
	TOTAL					13

APE 999 Doctoral Thesis 12 Units

An original investigation in any area of Applied Professional Ethics and Public Affairs, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge. The dissertation must be defended at an open oral examination organised by the School of Postgraduate Studies.

Doctor of Philosophy in Security and Intelligence Studies (SIS)

COURSE CODE	STATUS	COURSE TITLE	L	T	P	Units
COM 705	Audited	Facilitating Online	0	0	3	1
APE 999	C	Dissertation	0	0	36	12
	TOTAL					13

SIS 999 Doctoral Thesis 12 Units

An original investigation in any area of Security and Intelligence Studies, the title of which shall be approved by the School of Postgraduate Studies, and which makes an original contribution to knowledge. The dissertation must be defended at an open oral examination organised by the School of Postgraduate Studies.

INSTITUTE'S SERVICING OFFICERS LIST OF ACADEMIC STAFF AND AREAS OF SPECIALIZATION

S/N	NAME	STATUS	DEGREES	AREA OF SPECIALIZATION
1.	Prof. P. O. Aborisade	Professor	B.A. (Ife), M.A. (Port Harcourt) PhD (Ife), Certificate in Learning Technologies in EAP (Sheffield), AAU Faculty Online Teaching Modular Training (Accra)	Blended Learning, Technology-Supported Learning, Innovative Learning Spaces
2.	Prof. F. O. Olubode-Sawe	Professor	B.A., M.A. (Ilorin), PhD (Akungba) Certificate in Facilitating Online (Cape Town)	Terminology Development; Translation; Pragmatics; Small Group Collaborative Computer-Mediated Learning.
3.	Prof. T. J. Fola-Adebayo	Professor	B.A., M.A. (Ibadan), M.Sc. TESP (Aston at Birmingham), PhD (Ibadan), Certificate in Facilitating Online (Cape Town)	Literacy, TESP, Computer-Mediated Discourse, Innovative Learning Spaces
4.	Prof. M. O. Aderibigbe	Professor	B.A. (Ago Iwoye), M.A., PhD (Ibadan)	Bioethics, Research Ethics, Social and Political Philosophy, Security Studies.
5.	Prof. M. I. S. Onyibor	Professor	B.A. (Rome), PGD (Education), PGD (Public Admin), M.A. (Nsukka), PhD (Awka)	African Philosophy and Medicine, Philosophy of Education, Ethics of Public Administration and Policy, Business and Environmental Ethics, and Security Studies.
6.	Prof. (Mrs.) O. A. Abiolu	Deputy University Librarian	B.Sc.(Lagos), PGDCS (Akure), M.L.S, PhD (Ibadan), CLN	Information Studies, Women Studies, Environmental Studies, Academic Librarianship, Indigenous Knowledge
7.	Mr. A.A. Olofinsawe	Deputy University Librarian	B.Sc., M.L.S. (Ibadan) CLN	Cataloguing and Classification
8.	Dr. (Mrs.) C.F. Daramola	Deputy University Librarian	B.A. (Ife) M.L.S (Ibadan) PhD (Babcock) CLN	Serial Librarianship, Information Services
9.	Dr. O. E. Rasaki	Deputy University Librarian	B.LIS, M.L.S, PhD (Ibadan) CLN	Records Management and Conservation of Library Resources
10.	Dr. O. G. Adebola	Senior Lecturer	BSc (Zaria), MSc (Ilorin), PGDE (Ado Ekiti), PhD (KSU)	Medical Sociology, Gender and Culture
11.	Dr. T. R. E. Eegunlusi	Senior Lecturer	B.A. (Ado-Ekiti), M.A., PhD (Ibadan)	Ethics; Social and Political Philosophy; Business Ethics and Philosophy of Global Economy; Security Ethics; Environmental Ethics.
12.	Dr. G.O.O. Alofun	Senior Lecturer	B.A., M.A. Ph.D. (Ibadan)	Ethics; African Philosophy, Security Ethics, Gender Studies and Business Ethics.
13.	Dr. O. Inya	Senior Lecturer	B.A. (Zaria), M.A., PhD (Ibadan)	Metaphor, Pragmatics
14.	Dr. O. O. Adebomi	Senior Lecturer	B.A (Ado-Ekiti), PGDJ (Abuja), MA, PhD (Ibadan), Certificate in Facilitating Online (Cape Town).	Stylistics, Discourse Analysis, New Media Studies, African Literature, Digital Humanities.
15.	Mr. O.O. Oni	Principal Librarian	B.Agric.(Ago-Iwoye), M.L.S. (Ibadan)	Information Retrieval
16.	Dr. (Mrs) O.O. Okere	Principal Librarian	B.A.(Nsukka), M.L.S. (Ibadan), Ph.D. (Ife), CLN	Book Production Reprography, E-Learning, Scholarly Communication.
17.	Dr. I. A. Ayankola	Principal Librarian	BLIS., M.L.S, PhD (Ibadan),CLN	Records Management
18.	Mrs. O. A. Israel	Principal Librarian	BLIS., M.L.S, (Ibadan),CLN	Information Studies
19.	Dr. S. O. Fabunmi	Principal Librarian	BLIS., M.L.S, (Ibadan),PhD (Babcock), CLN	Library Routine Services, Reference Services, Digital Library
20.	Dr. Nifemi Damilola Bamidele-Nelly	Lecturer 1	B.A.(Ibadan), M.A., PhD (Babcock)	Gender Studies, African Literature, African American Literature
21.	Dr. F. M. Oguntade	Lecturer I	B.Ed. (Ife), MPA (Akungba), M.Ed., PhD (Ado-Ekiti), Certificate in Facilitating Online (Cape Town)	Literacy, Language Teaching & Learning.
22.	Dr. (Mrs.) F. R. Ayo-Olafare	Senior Librarian	B.A. (Ed)., M.L.S, (Ibadan),PhD (Babcock), CLN	Children Literature, Reference Services
23.	Dr. Akindeji Ibrahim Makinde	Lecturer II	B.Tech, M.Tech., PhD (FUTA)	Software Engineering, Machine Learning and Communication technologies

Library and Information Science (LIS) Programme

Prof. (Mrs.) O. A. Abiolu	Professor	NCE; B.Sc. (Lagos); PGDCS (Akure), M.L.S.; PhD (Ibadan); CLN	Information Studies, Women Studies, Environmental Studies, Academic Librarianship, Indigenous Knowledge
Dr. (Mrs.) C.F. Daramola	Associate Professor	B.A. (Ife) M.L.S (Ibadan) PhD (Babcock) CLN	Serial Librarianship, Information Services
Dr. O. E. Rasaki	Deputy University Librarian	B.LIS; M.L.S.; PhD (Ibadan); CLN	Records Management and Conservation of Library Resources
Dr. I. A. Ayankola	Deputy Librarian	BLIS; M.L.S.; PhD (Ibadan); CLN	Records Management
Dr. S. O. Fabunmi	Senior Lecturer	BLIS; M.L.S; (Ibadan); PhD (Babcock); CLN	Library Routine Services, Reference Services, Digital Library
Dr. (Mrs.) F. R. Ayo-Olafare	Principal Librarian	B.A. (Ed)., M.L.S.; (Ibadan); PhD (Babcock); CLN	Children Literature, Reference Services



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