Covenant Applied Informatics and Communication African Centre of Excellence (CApIC-ACE)

Covenant University

Students Handbook

2019 - 2024

TABLE OF CONTENT

CHAPTER ONE: INTRODUCTION

1.1 WELCOME FROM THE CENTRE LEADER

The proprietors of Covenant University right from inception noted the prime position of postgraduate training for the overall success of the institution and the rapid development of the nation. This was reinforced by the observed shortfall of about 56% in the cadre of qualified academic staff for the Nigerian University system. They also observed the inconsistencies in postgraduate education in the country in such key considerations as duration, quality and need. There was also the need to firm up on the research thrust to reflect the changing paradigms. These realities led to the establishment of the School of Postgraduate Studies. Post graduate studies and research at Covenant University will be reinforced by the Covenant Applied Informatics and Communication Africa Centre of Excellence (CApIC-ACE) which is one of the centres selected to be funded by the World Bank for 2018 – 2022 ACE-IMPACT project. CApIC-ACE was established based on the urgent need to build a critical mass of indigenous African scientists with the necessary bioinformatics, molecular biology, and information and communication engineering knowledge and skills to drive and sustain impactful researches in collaboration with academic, clinical and industrial institutions in Nigeria, West Africa, Africa, Germany, France, US and UK. CApIC-ACE hopes to evolve a FEDGEN cloud infrastructure (with in-memory computing and cloud AI capabilities) customised to process and analyse indigenous genomic data to address African health issues including health education, medication efficiency and early disease diagnosis. Also, it strives to develop new diagnostic biomarkers for prostate and breast cancers as well as drug candidates for malaria.

1.2 COVENANT UNIVERSITY

1.2.1 History

On 12th February 2002, the Federal Government officially presented to Dr. David Oyedepo the certificate which granted Covenant University Ota, Ogun State the licence to operate as a Private University in Nigeria. Dr. David Oyedepo is the President of World Mission Agency Inc., (an arm of Living Faith Church Worldwide) the proprietors of Covenant University. He is also the Chancellor of Covenant University.

Covenant University is a part of the Liberation Commission that God gave to Dr. David Oyedepo in an April 1981 vision encounter. As with all segments of the vision, he immediately kindled the fire of its accomplishment and by 27th November 1999, an in-house consortium on take-off of the University was inaugurated. As the activity of the consortium rounded off, an Advisory Council was inaugurated by 17th February 2001 to develop appropriate structures for the take-off of the University. By July 15th 2001, the verification team of the National Universities Commission came around on a final inspection of facilities and programmes. The outcome of that visit was the presentation of the operational license to Covenant University.

1.2.2 The Pedigree of Covenant University

Covenant University is born out of a vision, not an ambition. It is born out of a divine purpose and not from a secular desire. The Proprietors, World Mission Agency, is a brand plucked from the fire of Living Faith. It is a child born in an environment of success and an undeniable pedigree of

excellence. It is a direct product of the same zeal and the same purpose and the same foundation that gave birth to the largest single church auditorium in the world constructed in a period of 12 months.

We, therefore, introduce to you a carefully designed ark of educational safety and an instrument of rebirth, redemption and renewal for the nation. Covenant University has emerged from a foundation that is destined to outlast all contributors and beneficiaries.

1.2.3 Vision, Mission and Objectives

These vision, mission and objectives are driven by the Committee of the School and fully supported by the University Management led by the Vice-Chancellor.

Vision
To be a leading centre for postgraduate training for the needs of contemporary Africa.

Mission
To produce very high quality postgraduates by engaging best practices in programme, research and services, deploying life applicable, life promoting as well as cutting-edge techniques in our services and delivery.

Objectives
Among other things, the objectives of the School have been to:

i. develop in the students, the spirit of inquiry through training in research in an atmosphere of intellectuals' independence and creativity re-enforced with a strong sense of team work;
ii. foster through instruction, a deeper understanding of key academic concepts and applying fundamental ideas to solve societal problems of the society;
iii. provide training in research for future academics and other high calibre personnel in research and knowledge based organizations; and
iv. provide both short and long-term training opportunities to produce high level manpower needed for the rapid development of the nation.

1.2.4 Covenant University Core Values

Our Core Values as a University are the defining principles of the Covenant University Vision. These core values reflect our beliefs in the encrypted truths that firmly define our purpose and underlining ethos for our existence as a University.
As a University, we strongly uphold the practices embedded in our Core Values as listed below. We strive to integrate these values into all facets of our functions and operations as a University. We strongly expect that students of Covenant University will visibly demonstrate and integrate the virtues embedded in these core values in their daily conduct. These core values are the major tools for raising a new generation of Leaders for the Continent of Africa.

Our Core Values

- Spirituality
- Possibility Mentality
- Capacity Building
- Integrity
- Responsibility
- Diligence
- Sacrifice

Spirituality

This forms the bedrock of our existence as a University and defines every aspect of our operations and context. The Christian ethos guides our activities and conduct at all times and every student of Covenant University is expected to exhibit character traits and dispositions of the Jesus-centered heritage. The Jesus-factor centered approach to all issues is non-negotiable and central in the pursuit of our mandate in raising a new generation of leaders and in the realization of the objectives of our purpose. To this extent, therefore, students will be committed to maintaining a high level of spirituality and shall act in such a manner as to facilitate their spiritual growth as well as work out ways to evolve and implement a spiritual development plan. Attendance at Chapel Services is a compulsory part of students' spiritual development. The Bible and notebook are essential kits for the Service. Students are expected to demonstrate a deep reverence for God at all times.

Possibility Mentality

Students of Covenant University are expected to exhibit a royal carriage, attitude, habits and character. They are expected to exude self-confidence and dignity at all levels in their mode of communication, interaction and general conduct. They are expected to see themselves as persons of worth and value, taking pride in their uniqueness as individuals with a positive mindset devoid of any trace of inferiority. They are also expected to be articulate in expressing with a positive self-image and a patriotic disposition towards their nation.

Capacity Building

Students are encouraged to constantly seek paths for self-improvement. Openness to learning new skills and taking on board new information is a trait expected of Covenant University students in order to cause a robustness and depth in the quality of their output.

Integrity

Students of Covenant University are expected to demonstrate traits of honesty, uprightness and trustworthiness at all times. They must ensure that they are accountable persons, whose word is their bond. They are expected to be transparent and open in all their dealings. They must uphold integrity in matters of conduct during examination, obeying the rules and regulations of the University. They are being brought up to be spiritually sound, morally upright and possessing a good conscience.

Responsibility

We are committed to inculcating a sense of responsibility in our students. We expect them to do what is right at all times. We believe in the place of discipline for effective leadership. Our students are taught to respond to issues as demanded not as convenient. Here at Covenant University, our students are not permitted to do what they like but what is right. Punctuality at lectures as well as prompt response to assignments as demanded are desired traits of responsibility.

Diligence
Students of Covenant University are expected to be strongly committed to their assignment. We expect that they will extol the virtues of hard work and deliver qualitative output. They constantly strive towards excellent attainment of high standards in all they do. We believe that commitment is the greatest qualifier for attainment, hence our celebration of this trait in preparing students for leadership responsibilities.

Sacrifice
Sacrifice is the ultimate price for outstanding leadership. It is the quality of sacrifice that defines great leadership. We, therefore, expect students of Covenant University to go the extra mile, paying the extra price in the attainment of their set goals. Raising an altar of sacrifice in pursuit of their dreams is what must distinguish and define the Covenant University Student.

1.2.5 University Resource Centers

1.2.5.1 Centre for learning resources (Covenant University Library)

The library is the heart and life-line of any citadel of learning. The quality of teaching, learning and research is predicated on the robustness of the availability, accessibility and utilization of library and information resources. Libraries have been the repositories of the wisdom of mankind throughout the ages. They are the source of education inspiration and intellectual food on which lecturers, researchers, administrators and students are nourished.
The library in Covenant University is known as "Centre for Learning Resources" (CLR). The Covenant University library has fully computerized all routine activities and can boast of a functional virtual library service, which gives staff and students, access to the Web Public Access Catalogue (WebPAC), and other electronic resources from offices, departments wherever there is a web browser anywhere in the globe and anytime.
The library complex is an edifice with three floors, reputed to be one of the largest in Africa. The total floor area of the complex is 11,300m/2. It is designed as an imposing glass structure, which portrays learning as the major activity in the University. It is strategically located amidst the college buildings, the University Chapel and the Halls of Residence. It is able to accommodate up to 3000 readers and about 500 researching staff and postgraduate students.
http://clrmain.covenantuniversity.edu.ng/

1.2.5.2 Sports Complex

The University maintains a well-rounded programme of sporting and athletic activities under the supervision of experienced coaches. The administration of sports in the University is vested in the Sports Council. The Council organizes intramural, competitive and recreational sporting activities for students; conducts TMC physical fitness jogging and aerobic exercises and organizes sports lectures and seminars. The Sports Complex is located at the left side of the main entrance to the University. It provides for students and staff different facilities such as standard soccer pitch, basketball courts, hockey pitch, tennis courts, volleyball courts, swimming pool and a 9,000 seating pavilion. Interested students are encouraged to join any of the University teams where their talents will be nurtured and developed.

1.2.5.3 Covenant University Medical Centre.

Covenant University Medical Centre (CUMC) provides basic medical health services to students, staff, church members, as well as to the general public. In addition to providing basic health needs, the Medical Centre ensures adequate referral support /services. The Medical Centre is dedicated to helping people achieve and maintain healthy lives and restoring wellness/health to maximum attainable levels.

1.2.5.4 Centre for Systems and Information Services

The Centre for Systems and Information Services (CSIS) is the primary ICT service provider in Covenant University since its establishment in the year 2002 by the proprietor base of the institution. The centre works with every part of the University community-academic, support service, research, administration and professional services. Their core responsibility is to ensure proper deployment of ICT solution and services in teaching, learning, administration, student life, and research. The centre has a main objective of modernizing the infrastructure and services that support research activities of the institution while offering a wide range of IT services to the University community.

1.3 COVENANT APPLIED INFORMATICS AND COMMUNICATION AFRICA CENTRE OF EXCELLENCE (CAPIC-ACE)

Covenant Applied Informatics and Communication Africa Centre of Excellence (CApIC-ACE) domiciled at Covenant University was established based on the urgent need to build a critical mass of indigenous African scientists with the necessary bioinformatics, molecular biology, and information & communications engineering knowledge and skills to drive and sustain impactful researches in the areas of malaria, prostate and breast cancer as well as cloud and high performance computing as related to personalized medicine, in collaboration with academic, clinical and industrial institutions in Nigeria, West Africa, Africa, Germany, France, US and UK. CApIC-ACE is built on the existing infrastructure and personnel as well as externally-funded research projects and collaborations for malaria, Federated Genomic (FEDGEN) and cancer at Covenant University. It hopes to evolve a FEDGEN cloud infrastructure (with in-memory computing and cloud AI capabilities) customised to process and analyse indigenous genomic data to address African health issues including health education, medication efficiency and early disease diagnosis. Also, it strives to develop new diagnostic biomarkers for prostate and breast cancers as well as drug candidates for malaria.

1.3.1 CApIC-ACE Programmes

The Covenant Applied Informatics and Communication Africa Centre of Excellence (CApIC-ACE) was set up to fill a growing education, skills and information gap in the field of bioinformatics, molecular biology, and information & communications engineering to address the regional development challenge of malaria, prostate and breast cancer.

CApIC-ACE offers the following degree programmes to train students in line with the goals of the Centre:

1. M.Sc. and PhD in Bionformatics
2. M.Sc. and PhD in Biochemistry

3. M.Sc. and PhD in Computer Science
4. M.Eng and PhD in Information and Communication Engineering

1.3.2 CApIC-ACE Research

CApIC-ACE aim to be a citadel of knowledge creation in the application of informatics (in our case, Bioinformatics) and Communication to translational bioscience of malaria and breast/prostate cancer and will consequently provide an excellent biomedical platform for technological advancement – creation, usages and export, for the Africa people. It is noteworthy that the West and Central African countries in 2018, comprising approximately 42% of the over 1.2 billion African population and more than 5% of the world's population, are developing countries within the Sub-Saharan Africa. The rapid population increase and urbanization in West and Central African countries have contributed to increase in diverse vectored e.g. malaria and non-communicable e.g. cancer (breast and prostate) diseases. The highest mortality rates from these diseases occur in developing countries, including Sub-Saharan Africa, usually due to religious beliefs, misdiagnosis, stigma and improper control and treatments. Therefore, our center, CApIC-ACE will use a panel of bioinformatics tools to identify and develop new diagnoses, treatments and controls to reduce disease burden of three diseases, namely malaria, breast cancer and prostate cancer.

Our African Centre of Excellence (ACE) aims in the first part, to contribute significantly to the understanding of the genomics of cancer in early diagnosis and risk assessment; in the development of new diagnosis, treatment and control for the following key diseases – malaria, prostate cancer and breast cancer. In the second part, we will leverage on our efforts in the first part to upgrade our High Performance Computing (HPC) facility to implement a first version of an in memory database computing platform to bring home genomic research to the African populations, customized to address specific issues of Health in African populations, namely Health Education, Medication efficiency and enhancement of early disease diagnosis. Our major research areas include:

● Malaria: This disease mostly affects the sub-Saharan Africans, it accounted for 91% of the 445,000 global deaths in 2016 (WHO, 2017), and requires the indigenes to tackle it. However, the process of drug and insecticides discovery is time consuming (up to 10 years), tedious, expensive (~US$2.6 billion) and requires multi-disciplinary experts to bring it to fruition. This implies that the developed countries will focus their energy and resources on the diseases that burden them. Therefore, with sparse capacity and limited resources, CApIC-ACE will build more capacity and strive to establish drug and insecticidal targets discovery and validation resources locally, thereby reducing cost and time, and improving health in the region. CApIC-ACE will collaborate with key institutions to train regional M.Sc and Ph.D. students through scholarships and faculty members through fellowships and interested scientists through occasional professional workshops to build the needed capacity.

● Cancer: Prostate and breast cancer result from uncontrolled growth and spread of harmful cells in the prostate and breast, respectively, and mostly affect West Africans. Due to the limited cancer research and reporting system in the West and Central African region, many cancer cases remain misdiagnosed, improperly treated or untreated, and possibly result in mortality. Additionally, there is difficulty in diagnosis, hence the need to identify responsible genes for possible polymorphisms to improve disease diagnosis, and for risk determination, which will be done by CApIC-ACE. By applying genetics, the outcome of the cancer research at CApIC-ACE will lay the foundation for the development of biomarkers. In addition to the training of postgraduate students for degree

programmes, CApIC-ACE will organize short professional courses for medical students, resident doctors and young researchers on cancer genomics and methods of early cancer detection and also provide genomic research support..

● Federated Genomes analysis based in Memory Database Computing Platform (FEDGEN): Many healthcare challenges in Africa (and specifically in the West and Central Africa sub-regions) are not properly tackled and reported due to the paucity of computational and communication infrastructure. Therefore, CApIC-ACE will deploy applications through which genomics dataset that underlie the targeted diseases (malaria, breast and prostate cancer) can be analysed for enhanced early diagnosis and to educate the people on many health issues as well as communicate medication efficiency.

1.3.3 CApIC-ACE Faculty and Staff

Position	**Status**
Centre Leader: **Ezekiel Adebiyi**	Professor of Computer Science & Bioinformatics
Deputy Centre Leader I: **Emeka E.J. Iweala**	Professor of Biochemistry
Deputy Centre Leader II: **Emmanuel Adetiba**	Professor of Information &Communication Engineering
Applied Research Coordinator: **Victor C. Osamor**	Professor of Computer Science & Bioinformatics
Academic Program Coordinator: **Jelili Oyelade**	Associate Professor of Computer Science & Bioinformatics
Applied Research Coordinator: **Solomon Rotimi**	PhD & A/Professor in Biochemistry
M&E Officer: **Olubanke Ogunlana**	Professor of Biochemistry
Environmental & Safeguard Officer: **Grace Olasehinde**	Associate Professor of Microbiology
Industrial Liaison Officer: **Yvonne Ajamma**	PhD Genetics
Project Manager: **Babajide Ayodele**	B.A Linguistics
Head, Financial Management Analyst: **Mr Babatunde ONATOLA**	HND Statistics, PGD Mgt., ACA
Project chartered Account **Mr. Omisakin Olumuyiwa Oluremi**	B.Sc Accounting, ACA
Chief Internal Auditor Mr **Ojiaku Joel Ugochukwu**	HND Accountancy, ICAN, CITM

Asst. Internal Auditor: **Mrs. Joy A. Igba**	PGD, HND Accountancy
Communication Officer: **Ms. Thelma Ededet Ekanem**	M.Sc, B.Sc Public Relations & Advertising
Procurement Officer: **Mr. David G. Obaoye**	MBA, B.Sc Economics, ACIPurS, ACIA, ACIPM, ANIMANIM
ACE Administrative Team Leader: **Ms. Helen Jevwegaga**	M.Sc Industrial Relations & HRM, B.Sc Business Administration

Other Faculty and staff

S/n	Name	Status
1	Prof. Abiodun H. Adebayo	Professor of Biochemistry
2	Prof. Olayinka O. Ajani	Professor of Chemistry
3	Dr. Marion O. Adebiyi	Lecturer, Computer and Information Science
4	Dr. Joke A. Badejo	Lecturer, Information and Communication Engineering
5	Dr. Titilope M. Dokunmu	Lecturer, Biochemistry
6	Dr. Itunuoluwa M. Isewon	Lecturer, Computer and Information Science
7	Dr. Omolara F. Yakubu	Lecturer, Biochemistry
8	Engr. Boladele M. Akanle	ICT

CHAPTER TWO: GUIDELINES OF THE SCHOOL OF POSTGRADUATE STUDIES

2.1 PREAMBLE

All activities and operations of the School of Postgraduate Studies are governed by well specified guidelines.

2.2 ADMISSION

There are general and specific requirements for admission of an applicant into any of the Postgraduate programmes of Covenant University.

General Admission Requirements

To be considered for admission into any postgraduate programme of Covenant University the applicant shall:

i. Satisfy the general University requirements as well as any special requirements for admission into the programme of interest.
ii. Complete the application form on the University portal and ensure that the information submitted is accurate.
iii. Provide all relevant documents, including certificates of degrees and/or diplomas, academic transcripts, reference letters, etc. as specified on the application form.
iv. Request and ensure that all institutions attended process and forward official academic transcripts (undergraduate and/or postgraduate) to the School of Postgraduate Studies. Transcripts must be received directly from the applicant's institution.
v. Provide the National Youth Service Corps (NYSC) discharge, exemption or exclusion certificate if he/she is a Nigerian citizen.

2.2.1 Master's Degree Programme

To be considered for admission into Master's (M.A., M.Sc., M.Eng. MBA and MPA) degree programmes of Covenant University, an applicant shall have:

i. Bachelor's degree in relevant discipline with at least second class lower division from Covenant University or any other university recognized by the Senate.
ii. Postgraduate diploma (PGD) with a minimum CGPA of 3.5 in addition to a Bachelor's degree (minimum of third class Division) or HND (minimum of Lower Credit) in a relevant discipline.
iii. Applicants with relevant professional qualifications such as ACA, ICAN, ACIB, etc., who do not have either B.Sc degree or HND, would need to obtain the relevant PGD before applying for the professional Master's programme of the University such as MBA, MPA or MIT.

2.2.2 Ph.D Degree Programme

To qualify for admission into the Ph.D degree programme of Covenant University, an applicant shall possess:

i. Bachelor's and Master's degrees [M.A/M.Sc/M.Eng/M.Tech] in the relevant discipline obtained from Covenant University or any other university recognized by the Senate.

ii. A minimum CGPA of 4.0 on a 5.0 point scale or equivalent in the Master's programme to qualify for a direct entry into the Ph.D degree programme.
iii. Applicants with CGPA of 3.50 – 3.99 on a 5.0 point scale or equivalent in the Master's programme may be considered for M.Phil/Ph.D programme.
iv. Applicants with professional Master's degrees shall not be eligible for Ph.D programmes except they obtained M.Sc degrees in the relevant fields.

2.2.3 Screening and Selection Criteria

i. All applicants for admission into the postgraduate programme of Covenant University shall undergo a screening process to determine eligibility.
ii. The screening shall include written and oral tests in the applicant's desired programme and also an appraisal of readiness to comply with the rules and regulations for postgraduate training in Covenant University.
iii. An applicant shall have a minimum score of 50% in the screening tests to be eligible for admission.

2.2.4 Provisional Admission

i. Selected applicants, having met the stipulated criteria for admission, shall be offered provisional admission into the applicable programmes.
ii. A non-refundable acceptance fee shall be paid by the admitted candidates within two weeks of the offer while the remaining shall be paid on or before resumption.
iii. The admission shall be withdrawn if any of the conditions stated above is not complied with or if any information supplied by applicant is found to be false.

2.2.5 Registration and Matriculation

i. Registration and matriculation are the criteria for studentship in Covenant University.
ii. All newly admitted students must register and matriculate (for candidates who are not graduates of Covenant University) to become bona fide postgraduate students of Covenant University.
iii. A candidate must register at the beginning of every academic session all through the period of studentship.
iv. Full payment of all the stipulated fees for the session is a prerequisite for registration.
v. Registration forms shall be completed online; printed copies shall be submitted to the School of Postgraduate Studies after endorsement by relevant officers in the candidate's Department.
vi. Any student who fails to register for an academic session is deemed to have voluntarily withdrawn from the postgraduate programme of Covenant University.

2.3 DURATION OF POSTGRADUATE STUDIES

Master's Programme:

The minimum duration is four (4) semesters or two (2) academic yearsfor full-time and six (6) semesters or three (3) academic years for the part-time Master's programme (M.A, M.Sc, M.Eng, MBA and MPA).

Ph.D Programme:

The minimum duration is six (6) semesters or three (3) academic yearsfor full-time and eight (8) semesters or four (4) academic yearsfor the part-time Ph.D programme.

2.4 RESIDENCY

A student shall not stay more than one academic session above the minimum duration for the programme.

2.5 STUDY STRUCTURE

A. Structure of Masters' Programme

			Duration (Semesters)		
S/N	**Stage**	**M.A, M.Sc/M.Eng**		**MBA/MPA**	
		Full-Time	*Part-Time*	*Full-Time*	*Part-Time*
1.	Coursework	2	4	3	4
2.	Internship/Project	-	-	1	2
3.	Research Project	2	2	-	-
	Total Duration	**4**	**6**	**4**	**6**

B. Structure of Ph.D Programme

S/N	**Stage**	**Duration (Semesters)**	
		Ph.D	
		Full-time	**Part-time**
1.	Coursework	1	2
2.	Proposal Defence	1	1
3.	Field/Bench Work	2	3
4.	Post-field Defence/ Title Registration	1	1
5.	Assessors/Viva Voce	1	1
	Total Duration	6	8

2.5.1 General Course Grading Format

i. Lecture attendance is compulsory at all levels of the postgraduate studies.
ii. A student must have a minimum of 75% attendance in a course to be eligible to sit for the examination.
iii. Courses shall be examined at the end of each semester. A score of 50% is considered the pass mark for all Postgraduate courses.
iv. A Ph.D student must obtain a minimum CGPA of 4.0 in the course work to be eligible to proceed to the proposal defence stage of the Ph.D programme.
v. An M.Phil. Student must obtain a minimum CGPA of 4.0 in the course work to be eligible for conversion to the Ph.D programme and the proposal defence stage.

2.6 INTERNSHIP PROGRAMME

Internship programme in the students' relevant fields is a part of the requirements for the award of Master's and Doctorate Degrees in Covenant University. The programme is expected to take place after the Omega semester of the first year during the long vacation (June – July). The internship which shall last for a minimum of six (6) weeks is expected to:

i. Expose our students to 'real life' experience, thereby giving them practical experience in their various fields.
ii. Provide an opportunity for them to relate the theories and skills acquired in school to the practical realities of society, industry and organizations.
iii. Have a deeper understanding and experience of the needs of the society, industry, organizations.
iv. Develop research topics for their Master's/ PhD dissertations/theses on problem issues/areas related to the company or organization.
v. Possibly choose topics from where they are doing the internship.
vi. Students are expected to start the internship immediately after the conclusion of their course work examination.

2.7 PUBLICATION OF RESEARCH PAPERS

Publication of research findings in conference proceedings and journals indexed in Thomson Reuters or SCOPUS is a graduation requirement for all students on the Master's and Ph.D programmes.

i. In addition to other requirements for the award of Master's degree, a candidate must publish a minimum of two research papers in Thomson Reuters or SCOPUS indexed outlets (one paper each in a conference proceedings and a journal). A publication in the relevant University Journal may be accepted for a student on the Master's Programme.
ii. In addition to other requirements for the award Ph.D degree, a candidate must publish a minimum of three research papers in Thomson Reuters or SCOPUS indexed outlets (two papers in conference proceedings and one in a journal or one paper in a conference proceeding and two in a journal).

2.8 RESEARCH WORK

1) Appointment of Mentors/Supervisors

i. A postgraduate Student shall be assigned a Mentor on resumption of the postgraduate programme. Supervisor(s) shall be assigned after the completion of the course work.
ii. The Mentor shall interact with the student and provide guidance on course registration and possible area of research project.
iii. The supervisor(s) shall be expert(s) in the area of research the student will undertake.
iv. A student on the Master's programme shall be assigned one supervisor only.
v. The Ph.D student shall be assigned two supervisors (a main supervisor and a co-supervisor). At least one of the supervisors must be a full-time faculty of Covenant University. A student, under circumstances approved by the Dean, SPS, may be assigned three supervisors (i.e. an additional co-supervisor).
vi. The Supervisor(s) shall be nominated by the student's Head of Department in consultation with the Postgraduate Committee of the Department and the College.
vii. The names of the nominated supervisors for the Ph.D student shall be forwarded by the Head of Department through the College Coordinator and College Dean to the Dean, School of Postgraduate Studies (SPS).
viii. The SPS Committee shall scrutinize the nominated supervisors for Ph.D student and recommend same to the Senate for approval.
ix. Approved supervisors for the Ph.D. student shall be issued letters of appointment (as supervisors) by the Dean, SPS.

2) Dissertation/Thesis:

i. The student must at the end of the research write and submit a report of the project.
ii. The Master's report shall be by a Dissertation while the Ph.D report shall be by a Thesis.
iii. The student shall be mentored and guided all through the stages of research principally by the assigned supervisor(s).
iv. The Master's dissertation shall be examined and graded (over one hundred) by an external examiner, and shall be part of the final CGPA of the candidate.
v. The Ph.D thesis shall be subjected to a viva voce by a panel of examiners, which must include an external examiner and graded over one hundred.

Progress Report:

i. Progress report on each Postgraduate student (Masters and Ph.D students only) must be submitted by the supervisor to the Dean, SPS through the Head of Department and the College
ii. Coordinator and College Dean at the end of every academic session.
iii. The report must state the present standing of the student and the stage in the programme.
iv. There must be satisfactory progress for a student to remain on the programme. Students who are not making satisfactory progress shall be counselled or advised to withdraw.
v. A student shall be advised to withdraw if there is no evidence of steady progress.

2.9 STAGES IN THE Ph.D PROGRAMME

A. COURSE WORK STAGE:

1) Teaching and Examination:

i. Each candidate must register and take the recommended units of courses for the programme.

ii. The courses shall be examined and graded by the respective lecturers at the end of each semester.

2) Approval of Course Work Results:

i. The Head of Department shall at the end of the course work compile the results of each candidate in the postgraduate programme and forward same to the Dean, SPS through the College Coordinator and College Dean.

ii. The Committee of the SPS shall consider the result and recommend same to the Senate of Covenant University for approval.

B. PROPOSAL STAGE:

1) Approval of Supervisors:

i. The Head of Department shall forward to the Dean, SPS through the College Coordinator and College Dean the names, qualifications and affiliations of proposed supervisors for each student.

ii. The Committee of the SPS shall scrutinize the proposed supervisors and recommend same to the Senate for approval.

2) Departmental Ph.D Proposal Seminar:

i. The student, under the guidance of his/her supervisors, shall present a Research Proposal seminar in the Department.

ii. All lecturers from the rank of Senior Lecturer in the Department should be given a copy of the written proposal at least seven days to the date of the proposal seminar.

iii. Suggested corrections/inputs on the proposal must be effected by the student to the satisfaction of the Head of Department and the supervisors.

iv. The student is considered ready for the M.Phil./Ph.D. Proposal Defence only after a successful presentation of the proposal in the Department.

3) Approval of Examiners for Ph.D Proposal Defence:

i. The Head of Department shall forward to the Dean, SPS the names of proposed examiners for Ph.D Proposal defence for each student.

ii. The examiners shall consist of the Head of Department (Chief examiner), at least three College/Departmental representatives, and the student's supervisors.

iii. The Committee of the SPS shall scrutinize the examiners and appoint a representative of the SPS for proposal defence.

iv. The Committee of the SPS shall recommend the panel of examiners to the Senate for approval

4) College Ph.D Proposal Defence:

i. Copies of the proposal shall be forwarded to all the approved examiners by the Head of Department at least 7 days before the date of the proposal defence.
ii. All lecturers in the Professorial cadre at the Student's Department must also be given a copy of the written proposal at least days to the date of the proposal defence.
iii. Each of the examiners must submit a written report on the seven proposal to the Dean, SPS.
iv. The reports shall be forwarded to the Head of Department for the student to effect correction on the written proposal before the date of the proposal defence. The Head of Department and student's supervisors should ensure that the corrections are satisfactorily effected.
v. The student shall present a proposed research topic to the examiners and other members of the University Community.
vi. The SPS representative must be physically present at the proposal defence (not by proxy). Absence of the SPS representative renders the proposal defence invalid.
vii. All other approved examiners must be present at the proposal defence. In the event of absence of any of the examiner, the Head of Department shall inform the Dean, SPS.The absence of only one examiner, save the SPS representative, shall not void the outcome.
viii. The result of the examination must be a consensus opinion of the panel of examiners.
ix. The signed report of proposal defence must reach the School of Postgraduate Studies within 72 hours after the examination.
x. The Committee of the School of Postgraduate Studies shall consider the report and recommend same to the Senate of Covenant University for approval.

C. FIELD/BENCH WORK STAGE:

i. The student shall proceed to full research work after a successful defence of Ph.D proposal and the approval of the same by the Senate.

D. POST-FIELD STAGE:

1) Post-Field Seminar:

i. The Head of Department, in consultation with the student's supervisors, shall after a satisfactory completion of the field work fix a date for Departmental post-field seminar not earlier than 3 months after the proposal defence.
ii. All lecturers from the rank of Senior Lecturer in the Department shall be given a copy of the research thesis 2 weeks to the date of the post- field seminar.
iii. Suggested corrections/inputs on the thesis must be carried out by the student to the satisfaction of the Head of Department and the Supervisors.

The student is considered ready for the Ph.D Post-Field defence only after a successful presentation of the Post-field seminar in the Department

2) Approval of Examiners for Post-Field Defence:

i. The Head of Department shall at the satisfactory presentation of Departmental post-field seminar by the student forward to the Dean, SPS through the College Coordinator and College Dean the names of proposed examiners for Ph.D post-field defence.

ii. The examiners shall consist of the Head of Department (Chief examiner), at least three College/Departmental representatives, and the student's supervisors.

iii. The Committee of the SPS shall consider the examiners and appoint a representative of the SPS for the post-field defence.

3) Post-Field Defence:

Copies of the Ph.D thesis shall be forwarded by the Head of Department to all the approved examiners at least 14 days before the date of the post-field defence.

i. All lecturers in the Professorial cadre in the Student's Department shall also be given a copy of the Ph.D thesis at least 14 days to the date of the post-field defence.

ii. All the approved examiners must submit a written report on the synopsis to the Dean, SPS through the College Coordinator and College Dean.

iii. The reports of the examiners shall be forwarded by the Head of Department to the Dean, SPS. The Head of Department and Student's supervisors shall ensure that the corrections are satisfactorily effected.

iv. The SPS representative must be physically present at the post-field defence (not by proxy). Absence of the SPS representative renders the post-field defence invalid. SPS Representative must submit a report to the PG School.

E. REGISTRATION OF TITLE:

i. The report of Post-field defence and proposed title of the Ph.D. thesis shall be submitted to the Dean, SPS for consideration.

ii. The Committee of the SPS shall consider the proposed title of Ph.D thesis and recommend same to the Senate of Covenant University for registration.

iii. The registered title of thesis shall be communicated to the Department by the SPS.

F. ORAL DEFENCE/VIVA VOCE STAGE

1) Appointment of Assessors:

i. The Head of Department shall forward to the Dean, SPS the names, qualifications and affiliations of proposed Assessors for student's Ph.D thesis. Nomination of proposed Assessors shall be a consensus of the postgraduate committee of the candidate's Department.

ii. There shall be two external Assessors and an internal Assessor for each Ph.D thesis.

iii. The Committee of the SPS shall consider the proposed Assessors and recommend same to the Senate of Covenant University for approval.

iv. Approved Assessors shall be communicated to the Department by the SPS.

2) Appointment of Examiners for Oral Defence:

i. The Head of Department shall forward to the Dean, SPS through the College Coordinator and College Dean the names of proposed examiners for Ph.D Oral defence

for the candidate. Nomination of proposed examiners shall be a consensus of the postgraduate committee of the candidate's Department.

ii. The examiners shall consist of the Head of Department (Chief examiner), the candidate's supervisors, at least two College/Departmental representatives, and an external examiner.

iii. The external examiner must be an expert in the candidate's Ph.D research.

iv. The Committee of the SPS shall consider the examiners, appoint a representative of the SPS, and recommend the panel of examiners to the Senate for approval.

3) Assessors's Report

i. A 'soft' bound copy of the Ph.D thesis shall be sent to each of the Assessors by the Dean, SPS.

ii. While submitting a 'soft' bound copy of the Ph.D thesis to the SPS, evidence that the candidate's Department has subjected the thesis to 'Plagiarism test' must be provided. The maximum allowable limit for direct copying or lifting from other sources and/or unreferenced portions is **20%**. Any percentage value above this threshold shall be rejected.

iii. A proof of consent form – FORM R – duly signed by all members of the PG committee of the candidate's department shall be submitted along with the 'soft' bound copy of the thesis that are to be sent to Assessors.

iv. Each of the Assessors shall return to the SPS, the report of the assessment of the Ph.D thesis.

v. Two of the reports must be positive for the candidate to proceed to the next stage.

vi. The Assessors reports shall be sent to the Department for the student to make corrections on the Ph.D thesis.

vii. The Head of Department and the student's Supervisors shall ensure that the suggested corrections on the thesis are satisfactorily effected.

viii. The corrected version of the Ph.D thesis (based on the Assessors' reports) shall be submitted to the Dean, SPS.

4) Oral Defence/Viva Voce:

i. A copy of the Ph.D thesis shall be sent to the external examiner and other members of the panel of examiners.

ii. Each examiner shall return to the Dean, SPS, their report of the assessment of the thesis.

iii. The external examiner's report and at least one internal examiner's report of the assessment must be positive for the candidate to be considered for oral defence. A date shall be fixed for the oral defence of the thesis once the received reports are positive.

iv. The external examiner and the SPS representative must be in attendance physically (not by proxy) before the oral defence can be regarded as authentic.

v. All other approved examiners must be present at the proposal defence. In the event of the absence of any of the examiner, the Head of Department shall inform the Dean, SPS. Absence of only one examiner, save the external examiner or the SPS representative, shall not void the outcome.

vi. The result of the examination must be a consensus of the panel of examiners.

vii. The signed report of the oral defence must reach the Dean, SPS on or before 72 hours after the examination.

viii. The Committee of the SPS shall consider the report and recommend same to the Senate of Covenant University for approval.

G. FINAL APPROVAL OF Ph.D THESIS:

i. All errors/mistakes pointed out during the oral defence of the Ph.D. thesis must be corrected by the candidate.
ii. The Head of Department (Chief examiner) and all the other examiners must certify that the candidate has carried out the corrections as directed during the oral defence.
iii. The candidate must submit two bound copies (hard cover) and a soft copy of the Ph.D. thesis to the SPS.
iv. The submitted thesis shall be subjected to 'Plagiarism test' by the Centre for Learning Resources (CLR).
v. A thesis shall be rejected if it fails the 'Plagiarism test' (i.e. contain more than 20 % direct copying or lifting from other sources and/or unreferenced portions).
vi. Plagiarism shall attract an immediate withdrawal of degree if discovered after it has been awarded.

CHAPTER THREE: GUIDELINES FOR THESIS/DISSERTATION WRITING

The "Guidelines for Thesis/Dissertation Writing" is a unified style for writing theses and dissertations prescribed by the School of Postgraduate Studies for all Postgraduate Programmes of Covenant University.

3.1 THESIS/DISSERTATION FORMAT

(i) Cover Page

The front hardbound cover and the first sheet of the thesis/dissertation constitute the 'cover page' and shall contain the same information as follows:

i. The title of the thesis/dissertation (in capital letters);
ii. The candidate's name in full (in capital letters) [in the order: Surname, forename, other name(s)];
iii. The candidate's matriculation number (Matriculation number 15ABC01548);
iv. The month and year of submission of the thesis/dissertation;
v. The title of the thesis/dissertation on the front hardbound cover shall be produced in gold.

(ii) Title Page

The title sheet shall contain the following:

i. The title of the thesis/dissertation (in capital letters);
ii. The candidate's name in full (in capital letters) [in the order: Surname, forename, other name(s)];
iii. The candidate's matriculation number (Matriculation number 15ABC01548);
iv. The candidate's qualification(s) at the time of submission;
v. The degree for which the thesis/dissertation was submitted;
   [A thesis/dissertation submitted to the School of Postgraduate Studies in partial fulfilment of the requirements for the award of … degree in … Department of …, College of … Covenant University, Ota, Ogun State, Nigeria (a particular programme (in capital letters)].
vii. The month and year of submission of thesis/dissertation

(iii) Acceptance page

The page shall be reserved for the official signatures of the Dean and Secretary of the School of Postgraduate Studies, testifying that the thesis/dissertation was accepted in partial fulfilment of the requirements for the degree in a particular programme, and on a particular day.

(iv) Declaration page

This page shall contain a statement signed by the student attesting that the thesis is an original work and has not been presented wholly or partially for the award of a degree elsewhere. The candidate must also be ready to take public responsibility of the thesis.

(v) Certification page

The page shall contain a statement signed by the Supervisor(s), the Head of the Department, the External Examiner and the Dean, School of Postgraduate Studies to the effect that materials recorded in the thesis/dissertation resulted from original research carried out by the candidate.

(vi) Dedication

The candidate is at liberty to dedicate the thesis/dissertation to person(s) or a cause. This is, however, optional.

(vii) Acknowledgements

The candidate's acknowledgement of the assistance rendered by others during the research and thesis/dissertation preparation should follow the dedication page.

(viii) Table of contents:

The table of contents should contain the list of all items in the thesis/dissertation and should indicate the first page of every item listed.

(ix) List of Tables/Plates/Figures:

This should contain the complete list of all cited tables, plates and figures in that order (i.e. list of tables, list of plates, and list of figures). Each list shall begin on a fresh page and must show the assigned number and title, and indicate the pages where they appear.

(x) Abbreviations/Glossary/Definitions:

A list of major abbreviations, with full meanings, and a glossary of foreign words used in the text should appear at the beginning of the thesis before the abstract page. The standard abbreviations for the specific discipline should be strictly adhered to.

(xi) Abstract:

Each thesis/dissertation shall have an abstract. The abstract shall be concise and contain a brief summary of the study background, objectives, design/methods, results/findings and conclusions. It shall be in one block paragraph. The abstract of a Ph.D. thesis shall not be more than 500 words while that of a Master's dissertation shall not exceed 300 words. There should be keywords (of not more than six words) at the end of the abstract.

(xii) The Main Body of the Thesis/Dissertation:

The main body of a Ph.D. thesis shall contain between 50,000 and 100,000 words whereas a Master's dissertation shall contain between 37,500 and 75,000 words except in exceptional cases, with the approval of the SPS Committee on the recommendation of the Postgraduate Committees of the Department and College.

The structure of the presentation may differ with discipline and subject matter. Nevertheless, the main body of the thesis/dissertation shall consist of six chapters as follows:

1) *Chapter One*: Introduction
   This chapter shall contain the background of the study, statement of the problem; the aim and objectives of the work; justification for the research; the scope of study and limitation of the research.
2) *Chapter Two*: Literature Review
   This chapter is a survey of relevant literature or related previous work on the subject matter and should take the form of a critical appraisal of the research subject.
3) *Chapter Three*: Methodology (or Materials and Methods)
   This chapter must contain detailed design of study; study population; sampling frame; sample size; description of all instruments, equipment, chemicals, procedures, data, etc. used in carrying out the research.
4) *Chapter Four*: Results

This chapter is focused on the data presentation of results and will feature tables, figures and relevant illustrations.

5) *Chapter Five*: Discussion
This chapter is where the candidate is expected to discuss research findings made as demonstrated by the results shown in the previous chapter. It is on the basis of this chapter that the researcher either accepts or rejects the hypotheses posed in the study or is able to discuss the findings at length based on the themes earlier drawn up as part of the Statement of the Problem vis-à-vis the objectives of the study. The chapter can also feature tables, figures and relevant illustrations.

6) *Chapter Six*: Conclusion and Recommendations
The emphasis of this chapter shall be on the findings and contributions to the existing body of knowledge on the subject area. It may contain a brief summary of the research aims and objectives, and its execution. The conclusions shall be the inferences drawn from the findings. The recommendations, if any, shall come after the conclusions. These should be itemized.

(xiii) List of References:

The list of references must include all papers cited in the body of the thesis/dissertation. It should be in one paragraph and be devoid of abbreviations. The Referencing Style prescribed by the School of Postgraduate Studies must be strictly followed throughout the thesis/dissertation.

(xiv) Appendices

Materials that are necessary to be included in the thesis/dissertation but which may break the flow or bore the reader shall be attached as appendices. Every attached appendix must be referred to at the appropriate sections of the thesis/dissertation. Items typically included in the appendices are:

- Pictures, diagrams, tables and graphs of results not considered important enough to appear in the main text;
- Files of data which are considered too large to be simply placed in the results;
- List of research instruments, chemicals and reagents; etc.
- Any other information considered important by the board of examiners.

3.2 PRINTING SPECIFICATION

The following format shall be complied with:

i) Paper Quality/Size

The paper used for the final copies of thesis/dissertation submitted to the School of postgraduate Studies must be of good quality, plain white, and not less than 80g/m^2. The paper size must be A4, approximately 21.0cm x 29.7cm (8.27in x 11.69in), except for drawings and maps where there is no restriction imposed.

ii) Margins

A margin of 3.125cm (1.25in) and 2.5cm (1.0in) shall be on the left hand side and right hand side respectively. A margin of 2.5 (1.0in) shall be on both the top and bottom of the page, except on the first page of each new chapter where the margin on the top shall be 5.0 cm (2.0in) above the headings.

iii) Word Processing and Typescript

Times New Roman, font size 12 should be used for all textual presentations, except in cases where special characters or fonts are required. All titles, headings and sub-headings should not be more than font size 14 of Times New Roman. Footnotes and endnotes, where applicable, should be done using Times New Roman, font size 10.

iv) Special Characters

Special characters such as mathematical symbols and equations and ascents like diacritics in some African language texts should be marked appropriately and consistently.

v) Spellings and Punctuations:

British spellings and punctuations are preferred for thesis/dissertation writing. However, the American spellings and punctuations may be allowed provided they are used consistently all through the presentation. An overlap of British and American spellings and punctuations is not acceptable.

vi) Spacing and Paragraphing

The body of the presentation should be in 1.5 line spacing. The list of references shall, however, be in single line spacing and there shall be a line space between the references. Block paragraphing is preferred over the indented; candidates should stick to this and be consistent throughout the presentation. There shall be a blank line before and after each paragraph.

vii) Headings and Sub-Headings

The main chapter or section heading shall be in bold lettering, capitalised and centralised at the top of the first numbered page of the chapter or section. It should be in Times New Roman, font size 14 and shall not be underlined. Scientific names of plants, animals and non-English words shall be italicised if they occur in the heading.

The sub-headings shall be in bold lettering, aligned to the left and written as marginal headings. It should be in Times New Roman, font size 13 and shall not be underlined. Only the first letter and proper noun shall be capitalised.

viii) Pagination

Roman numerals should be used for the pages preceding the first chapter (introduction) of the thesis/dissertation. The numeral "i" should, however, not appear on the first page of the thesis/dissertation which is the inner cover page. Arabic numerals, beginning with (1) shall be used for pages from the main body of the thesis/dissertation to the appendices. The page number shall be plain and written in the centre at the bottom of each page.

ix) Quotation of other Scholar's Works

All quotations, either made word by word with an inverted comma at the beginning and at the end or paraphrased, should be properly referenced. When a part or parts of a quotation is left out, especially to shorten a citation, this should be indicated through the use of the ellipsis, i.e. three symbolic periods (…). All quotations that extend more than four lines or one paragraph should be indented and in a single-line spacing, and without inverted commas at the beginning and at the end. The typical indented quotes must be placed within equidistant margins to the centre of the page. An extra blank line shall be left before and after the indented quote. For poetry quotes, the lines or whole stanza in the original text shall be presented as they appear but in single line spacing.

x) Plagiarism

There should be sensible and responsible quotation of other scholars' work. Repetitive and copious quotation from a particular material or a set of works by the same author is considered an act of plagiarism! Extensive copying of other scholars' works whether by direct quote, summary or paraphrasing renders a thesis/dissertation defective and lacking originality; such presentation shall be rejected and the candidate shall be indicted for plagiarism. Please note that every thesis/dissertation submitted to the School of Postgraduate studies shall be subjected to a thorough plagiarism check. A thesis shall be rejected if it fails the "plagiarism test" which shall not be more than 20%. Plagiarism shall attract an immediate withdrawal of degree if it has been awarded.

xi) Plates, Figures, Tables, Illustrations Drawings and Photographs

All plates, figures (charts, graphs, histograms, maps, etc.) and tables shall be assigned numbers and self-explanatory titles or captions. The numbers of plate and figure along with their titles shall be placed below the plate or figure on the same page. The word "Figure" could be abbreviated to "Fig". Either 'Figure' or 'Fig' should be used consistently all through the work. The number and title of a table should be at the top of the table. If a table, plate or figure is placed in a landscape position by reason of size of the width, the top should be to the spine, i.e. left side of the bound thesis/dissertation.

Units of measurements must be clearly indicated at the proper column of the table. Explanatory footnotes to tables should be indicated using standard footnote reference marks ($^{*, +, ++}$) or by use of superscript letters ($^{a, b, c}$) and placed after items to which the footnotes refer. The footnotes must appear below the table on the same page. Footnote may also be used in respect of figures. The word 'Plate', 'Figure' and 'Table' shall be in bold type and the first letter capitalised, marginal and followed by the number after which a full colon and then the title or caption (e.g. Plate 1.1: A culture of *Aspergillus niger*). Each plate, table, figure and illustration must be referred to in the text. References to plates, figures and tables shall be made by their number and never by title or caption. The plates, figures and tables or illustrations should always be numbered by chapter e.g. Plate 1.2, Fig 2.1, Table 3.3, etc. The list of plates, figures and tables or illustrations etc. should be presented in the order they occur in the body of the work. Each plate, figure or table should be on a separate page and should not occur within the text and should preferably appear on the page immediately following their first mention. All cited tables, figures, drawings, photographs and maps must be acknowledged by appropriate indication of sources, including date/year, after the main information.

xii) Print Quality

The language of the thesis/dissertation must be clear, readable, understandable and of laser-print standard. Only one side of the paper shall be used. Photocopies must be such that they do not smudge or fade. Items from other sources must be retyped or redrawn to ensure clarity. Figures or diagrams that are too large to be satisfactorily reduced may be placed on larger papers or made to appear on several pages. Any photograph in the thesis/dissertation must be glossy, devoid of rough finish.

xiii) Binding

The hardbound copies of the final thesis/dissertation shall be submitted to the School of Postgraduate Studies. The cover colour shall be black and they shall have gold inscriptions of the title on the front cover. Besides, they shall have along the length of the spine from bottom top, the degree, date, and name of the author lettered boldly in gold.

xiv) Soft Copy

A soft copy of the thesis/dissertation shall be submitted alongside the hardbound copies to the School of Postgraduate Studies after the corrections of all the errors/mistakes as recommended by the examiners of the thesis/dissertation during the oral defence. This must be in MS word or any other format prescribed by the School but not in pdf.

3.3 SUBMISSION OF REPORTS/DISSERTATIONS AND THESES

a) Candidates for the Master's degree shall be required to submit a Research Project Report while those for the degree of Ph.D. shall be required to submit a Thesis.
b) When the candidate's dissertation/thesis is ready for examination, six copies of the duly certified dissertation/thesis, in temporary binding, shall be submitted through the relevant College to the School of Postgraduate Studies according to the prescribed procedure.
c) An oral examination shall hold within 15 working days of receipt of at least three positive examiners' report including that of the external examiner by the School of Postgraduate Studies.
d) Five hard copies of the successful dissertation/thesis suitably bound in hard cover, in addition to five virus-free electronic copies (in compact disks) shall be submitted to the School of Postgraduate Studies. The overall presentation of the dissertation/thesis must conform to stipulations under Regulations 18 and 19 above. Three hard and three virus-free electronic copies shall become the property of the Covenant University. Of these, one set of the hard and soil copies shall be deposited in the University Library, Department and the School of Postgraduate Studies respectively. The fourth set shall be sent to the major supervisor and the fifth set shall be returned to the candidate.

3.4 FINAL ASSESSMENT

3.4.1 General

a) Final assessment for higher degrees shall be undertaken only when all courses and project/dissertation/thesis requirements for degree have been fulfilled and certified by the supervisors.
b) Assessors: There shall be a panel of three assessors approved by the School, comprising three Senior Academics who are experienced in the field - two of whom must be external.
c) Final Assessment: The final assessment for all higher degrees shall include an oral Examination.
i) For the degree of M.A/M.Sc./M.Eng., an oral examination shall be arranged by the appropriate Department and shall involve external examiners.
ii) In the case of the M.Phil. and Ph.D., and without prejudice to the result of the examination as a whole, an oral examination will only be conducted if in the view of at least two of the three Assessors, the candidate's submission merits oral examination.
d) There shall be a panel of examiners for the examination of each research thesis in accordance with Regulation 16 above.
e) Any breach of Regulation (d) above shall render the examination thereof null and void.
f) The Chief Examiner shall submit to the Dean of the School of Postgraduate Studies the final assessment report duly signed by all the examiners on the prescribed form not later than two working days after the oral examination, except that where the examiners cannot agree on recommendation and are, therefore, unable to submit a joint report, individual examiners may submit separate reports to the Secretary of the School of Postgraduate Studies, through the Dean of the Colleges, who shall have no discretion on the matter.

g) In a case where the examiners are unable to agree on a joint report as indicated in (f) above, the Committee of the School of Postgraduate Studies shall exercise its discretion to seek the opinion of an assessor or assessors from outside the University. Under no circumstances shall this function of the Committee be delegated.
h) The Dean of the School of Postgraduate Studies (or his/her representative) shall represent the School while the Chairman of the College Committee in the Colleges shall represent the Committee of the School of Postgraduate Studies at the oral examination of all candidates for the M.Phil. a Ph.D. degrees.
i) j) An amendment to the approved title of dissertation/thesis shall constitute a major revision. Panel of examiners may not recommend an amendment of title without at the same time referring the dissertation/thesis to the Postgraduate Committee for the approval of Senate.
k) A candidate who presents a thesis which in part or in full is discovered not to be his original work shall be deemed to have failed and shall not be qualified for the degree. Similarly, a candidate who presents a thesis which is discovered at any stage to partially or wholly contain falsified data or material shall not qualify for the degree.
l) A candidate who fails an examination leading to the award of degree shall not be permitted to re-apply for admission to the same degree programme.

3.4.2 Candidate's Performance

a) If the candidate satisfies the examiners in the Oral examination and the thesis is acceptable to the examiners in its present form, the Chief Examiner shall then process the result to the School of Postgraduate Studies through the College Committee not later than two (2) weeks from the date of the candidate's submission
b) If the candidate satisfies the examiners in the Oral examination and the thesis is acceptable to the examiners subject to minor corrections, such corrections shall be carried out within six (6) weeks to the satisfaction of the Chief Examiner and Supervisor(s) and be certified by them on the appropriate form. The Chief Examiner shall then process the result to the School of Postgraduate Studies through the College Committee not later than two (2) weeks from the date of the candidate's submission.
a) If the candidate satisfies the examiners in the oral examination, but the thesis is unacceptable to the examiners in its present form due to the need for structural or major amendments, such as re-writing some portion of the thesis, the candidate shall not require re-examination. However, the structural or major amendments shall be carried out within a period not exceeding three (3) months to the satisfaction of all Internal and External Examiners and be certified by all the examiners in the appropriate form. The Chief Examiner shall then process the result to the School of Postgraduate Studies through the College Committee not later than two (2) weeks from the date of the candidate's submission.
d) If the thesis is satisfactory but the candidate fails to satisfy the examiners in the oral and/or written examination, the candidate may be recalled for a second oral/or written examination after a further period of study not exceeding one semester from the date of the examination and only after approval of same by the Committee of the School of Postgraduate Studies on the recommendation of the College Committee. However, the examination cannot be repeated more than once.
e) Where the thesis is considered inadequate or unworthy of the award of the degree, a revised thesis may not be re-submitted for re-examination unless after prior approval of the Committee of the School of Postgraduate Studies, on the recommendation of the College Committee. However, this re-submission must be done within two (2) semesters of the first examination,

failing which no degree will be awarded. The examination shall be in accordance with Regulation (a) - (f) above and cannot be repeated more than once.

f) A candidate whose thesis is rejected in its entirety by the examiners shall be deemed to have failed the examination and shall not be awarded the degree.

3.4.3 Progress Reports

a) Each College and Department shall be required to keep a progress report on each candidate every semester showing dates of admission, registration of the title of thesis, names of supervisors; University and External Examiners; final oral thesis examination, and award of degree.
b) Progress report on each Postgraduate student (Master's and Ph.D. students only) must be submitted by the supervisor to the Dean, SPS through the Head of Department and the College Coordinator and College Dean at the end of every academic session. Such progress reports on candidates shall be remitted to the Committee of the School of Postgraduate Studies by each College Committee at the end of each session.
c) The report must state the present standing of the student and the stage in the programme.
d) There must be satisfactory progress for a student to remain on the programme. Students who are not making satisfactory progress shall be counselled or advised to withdraw.
e) A student shall be advised to withdraw if there is no evidence of steady progress.
f) The Committee of the School of Postgraduate Studies shall prescribe the form and design of the progress report(s)

3.4.4 Award of Higher Degrees

The award of higher degrees to candidates, who have satisfied all the requirements for such degrees, including the prescribed period of study, shall be approved by Senate, on the recommendation of the Committee of the School of Postgraduate Studies. The requirements shall include:

i. Passing of written and/or practical examination in the subjects of the student's study programme;
ii. Submission of a Project Report/Dissertation/Thesis and its acceptance by the examiners appointed for that purpose;
iii. Passing of an oral examination on the subject of the thesis and related subjects.

3.4.5 Request for Academic Transcript

The School of Postgraduate Studies sends Transcripts to Institutions and Establishments where they are needed, at the request of the student. Requests are to be made on the prescribed forms obtainable from the School and on a prescribed fee.

Approval of Departmental and College Requirements

Specific Departmental and College requirements, additional to or consequent on these General Regulations shall not be binding unless approved by Senate on the recommendations of the Board of the School of Postgraduate Studies.

CHAPTER FOUR: ETHICS AND CODE OF CONDUCT

The ethics of the School of Postgraduate Studies is premised on the following background:

- Covenant University is a Christian mission University.
- Every graduate of Covenant University must in every way reflect the ideals and expectations of the University.
- There is the need to institutionalise standards of conduct for the students in line with University's core values and expectations.
- There is the need to carefully interview all applicants at the point of entry to screen out those that do not conform to Covenant University core values and ethos.

4.1 Definition of a Student

A student in Covenant University is anyone who has been duly registered, having met all the requirements for admission to a programme of choice in the University and is actually involved in all Academic and Non-Curricular activities on campus. Such a person must be duly matriculated either at the Undergraduate or Postgraduate level.

4.2 Regulations on Students Conduct and Discipline

A high standard of personal discipline and integrity is expected of every student. Covenant University regards all acts of unethical, immoral, dishonest or destructive behaviour as well as violations of University regulations, as serious offences. It is the responsibility of each student to know these regulations. All members of the Covenant University Community are to obey the laws of the nation and to embrace the demands of mutual coexistence with their neighbours.
The power to discipline students who violate the University's rule and regulations is vested in the Students' Disciplinary Committee (SDC). There is also an Investigating Committee within the Student Affairs Department which investigates alleged offences and submits a report to the SDC. Students shall be given fair hearing in the disciplinary process.

The use of cell phones may be permitted outside the lecture and examination halls since some postgraduate students are responsible adults and parents who need to be in constant touch with their family members.

The use of personal vehicles may be permitted to guarantee easy movement of the postgraduate students, particularly, those that may not be resident on campus.

4.3 Dress Code

The University attaches great importance to modest and decent dressing. Dressing adds value to a person's personality, self-confidence and self-worth. Indeed, "The way you dress is the way you are addressed." Dress code is one of the unique aspects of Covenant University's culture that students must imbibe to make their academic pursuit pleasurable. Our Dress Code is hereby presented for your COMPLIANCE.

4.3.1 Dress Code for All Female Students

i. Female students must be corporately dressed during normal lectures, public lectures, special ceremonies, Matriculation, Founder's Day, Convocation, and examinations. To be corporately dressed connotes a smart skirt suit, skirt and blouse, or a smart dress with a

pair of covered shoes.

ii. All dress and skirt hems must be AT LEAST 5-10cm or 2-4 INCHES BELOW THE KNEES.

iii. Female students may wear decent "native" attire or foreign wear (decently sowed) outside Lecture and Examination Halls.

iv. The wearing of sleeveless native attires or baby sleeves and spaghetti straps without a jacket is strictly prohibited in the lecture rooms and in the University environment.

v. Any shirt, worn with a waist coat or armless sweater should be properly tucked into the skirt or loose trousers. It should never be left flying under the waist coat/armless sweater. The waist coat/armless sweater must at least rest on the hip. "Bust coats", terminating just below the bust line are not allowed. However, shirts with frills are allowed.

vi. Jersey material tops are not allowed for normal lectures, and other University assemblies.

vii. Skirt could be straight, flared or pleated. Skirts with uneven edges are not allowed. PENCIL SKIRTS ARE ALSO NOT ALLOWED. Lacy skirts are better worn to church. None should be tight or body hugging.

viii. The wearing of dropping shawls or scarves over dresses or dresses with very tiny singlet-like straps (spaghetti strap) is strictly prohibited in the Lecture and Examination Halls and in the University environment.

ix. The wearing of strapless blouses or short blouses that does not cover the hip line is strictly prohibited in the Lecture and Examination Halls and in the University environment.

x. The wearing of over-clinging clothing, including body hugs, hip-stand trousers and any clothing made from stretchy, elastic material, is strictly prohibited in the Lecture and Examination Halls and in the University environment.

xi. The wearing of revealing blouses, especially low-cut blouses and the type of blouse that does not cover the navel, is strictly prohibited in the Lecture and Examination Halls and in the University environment.

xii. The wearing of ordinary transparent dresses is strictly prohibited in the Lecture Rooms and in the University environment. Transparent dresses may be worn with DARK singlet or other forms of DARK inner wears.

xiii. The use of face-caps in the Lecture Rooms, Examination Halls, University Chapel and in the University environment is strictly prohibited.

xiv. Wearing slippers and half-shoes is not allowed in College buildings, Library, Cybercafe and Chapel from 7am-6pm.

xv. Female students are advised to wear corporate hairstyles that are moderate and neat that characterised a decent and joyful, University student. In addition, use of hand dryer should be restricted to the hairdressing saloon.

xvi. Coloured hair, coloured attachments and or the use of two or more shades of coloured attachments are strictly prohibited in the University.

xvii. Female students may wear trouser suits, however, the jacket, must fall below the hipline.

xviii. Earrings and necklaces may be used by female students, provided they are not the bogus and dropping types. The wearing of more than one earring in each ear is strictly prohibited anywhere in the University.

xix. Wearing of ankle chains and rings on toes is prohibited in the university community.

xx. The possession and, or wearing of Jeans or any jeans like materials of any kind for example Chinos, Corduroy and Alanshi is strictly prohibited in the University environment and Canaan Land.

xxi. Female students can wear low sandals or covered corporate shoes.

xxii. Tennis shoes or sneakers may only be worn outside the Lecture and Examination Halls.

xxiii. Piercing of any part of the body, other than the ear (for earrings), is strictly prohibited (Any piercing done before Admission into the University shall be declared during the first Registration in the first year. Failure to do so will attract requisite penalty.

xxiv. Tattooing of any part of the body is prohibited (Any Tattoo done before Admission into the University shall be declared during the first Registration in the first year. Failure to comply will attract appropriate sanction.

xxv. Skirts must be worn with slips underneath. Also skirts slits should not be unnecessarily long and should not expose the knees or any other part of the body that ought to be covered.

xxvi. Wearing of Stiletto & bogus shoes as well as clothing and jewellery that do not conform to the prescribed dress code is strictly prohibited from the university environment and will be confiscated.

xxvii. The wearing of ¾ (three quarters) trousers of any kind to the lecture halls, Chapel Services or during official hours is strictly prohibited. Farmer's shorts are prohibited. They can only be worn around the Students' Residential Area. Farmers' shorts are prohibited.

xxviii. Wearing of boob tubes and camisoles under jackets should be done properly. The entire body must be covered. No part of the chest should be revealed.

xxix. Wearing of tops, shorts or T-Shirts with unholy inscriptions such as SEX, BITCH and other forms of indecent words is not allowed anywhere in Covenant University and Canaan Land.

4.3.2 Dress Code for All Male Students

i. All male students are expected to dress corporately to the Lecture Halls, Examination Hall and special ceremonies, such as Matriculation, Founder's Day, Convocation, public lectures, Church Services, and other events specifically so stated. To be corporately dressed connotes a shirt and necktie, a pair of trousers, with or without a jacket, and a pair of covered shoes.

ii. For national days such as Independence Day, national dressing code may be observed. Any shirt with unholy inscriptions or any sign with hidden meaning is strictly outlawed as it would be taken as cultism.

iii. Band less trousers must never be worn without suspenders.

iv. Folding, holding and pocketing of tie along the road, lecture halls, Chapel assemblies, etc. is strictly prohibited in the University.

v. Wearing of tie with canvas is not corporate. Therefore, such an act is not allowed in the University environment. Jerry Curls and treated hair are strictly prohibited.

vi. Male students of the University may wear "native" attire or foreign wears outside lecture and Examination Halls. Every student dressing in western attire must wear a necktie to match. The tie knot must be pulled up to the top button of the dress shirt.

vii. No male student is allowed to wear scarves, braided hair, earrings and ankle chains in the University.

viii. Wearing of long-sleeved shirts, without buttoning the sleeves is not allowed.

ix. Shirt collars should not be left flying while collarless shirts are not allowed.

x. Shirts must be properly tucked into the trousers.

xi. The practice of pulling down one's trousers to the hip line is prohibited.

xii. Students are advised to have well-cut hair that is combed regularly. Afro-looking hairstyles are strictly prohibited. All male students are also expected to be clean-shaven, as keeping of beards is prohibited. In addition, use of clipper should be restricted to the barbing saloon.

xiii. The possession and/or wearing of Jeans or Jeans-like materials of any kind is strictly prohibited in the University environment and Canaan land.
xiv. Male students may wear French suits.
xv. Male students are to wear covered shoes to the University Chapel, all lectures, examinations and any University assembly.
xvi. The use of face caps in the Lecture Halls, Examination Halls and University Chapel is strictly prohibited, except for sports and other related events.
xvii. Piercing of any part of the body is prohibited (Any piercing done before Admission into the University shall be declared during the Registration in the first year; failure of which appropriate sanctions shall be applied.
xviii. Tattooing of any part of the body is prohibited (Any Tattoo done before Admission into the University shall be declared during the Registration in the first year; failure of which appropriate sanctions shall be applied.
xix. Clothing and jewellery that do not conform to the prescribed dress code will be confiscated. Jewellery such as neck chains, hand chains, bracelets finger and toe rings, ankle chains are prohibited for male students.
xx. Wearing slippers and half shoes, tennis shoes, sneakers, or canvas shoes is not allowed in and around the Lecture Halls of the University from 7 a.m. - 6 p.m.

4.3.3 Uniform Dress Code for Professional Disciplines

If any Uniform Dress Code is prescribed for female and male students in any College/Department of the University, particularly those in the professional disciplines, all students involved must adhere to the Uniform Dress Code very strictly. The University
Administration will consider any violation of it as a very serious one and severe disciplinary action will be taken against the defaulters, which may include a written warning, suspension or expulsion.

4.3.4 Penalties for Improper Dressing

a. Erring students shall be sent out of the Lecture Room, examination halls or back from the University area where such is not allowed at the time.
b. A warning letter shall be issued to the erring student and a copy of the letter shall be filed in his/her personal file in the University/Department.
c. The parents/guardians of the erring student may be informed in writing, accordingly.
d. The student shall be suspended from the University if unrepentant, subject to (a), (b) and (c) above. A student is considered unrepentant of the bad dressing habit if he or she has been warned of the offence up to at least two times.
e. Repeated case after two warnings or 4 weeks suspension shall attract suspension for one session or outright expulsion as the case may be.

4.4 Cultural Ethics

A man's culture influences his future. Thus, Covenant University has a formidable culture of nurturing a good future for the leaders that are being raised. An important aspect of our culture is respect for law and order as well as mutual respect for one another within the community. All covenant university students are to give due respect, honour and benevolence to their elders at whatever time and whatsoever context. Specifically, students are to note that:

a). Their smart and business-like comportment shall not lack respect in their countenance to senior or elderly member of the community whether in the class, in the halls of residence or anywhere on the campus.

b). helps and courtesies must be extended to the elderly or seniors wherever possible, practicable or affordable.

c). their countenance and composure to enquiries and instructions by faculty, staff and visitors must be devoid of arrogance, but, rather show respect, care and love.
Failure to abide by this shall attract severe punitive measures ranging from letter of warning to outright expulsion from the university.

4.5 Categories of Other Offences

Apart from the breach of dress codes, other offences fall into broad categories:

i. All cases of misconduct, which the Student Disciplinary Committee (SDC) could try.
ii. Criminal offences, which should be referred to the Police by the SDC for necessary action, where the Committee's opinion on the matter should be recognised. In this regard, the final decision of the Student Disciplinary Committee would depend on the outcome of Police investigations.

4.5.1 Misconduct

The following are misconducts for which the Student Disciplinary Committee can investigate and try students:

i. Unruly Behaviour
ii. Indecent Behaviour
iii. Vandalism
iv. Disorderly Assembly
v. Unauthorised displacement of University property
vi. Pilfering
vii. Stealing
viii. Insubordination
ix. Membership of Secret Cults
x. Damage of University Property
xi. Giving false identity/Information
xii. Overt Sexual Behaviour
xiii. Disregard for Spiritual Value and institution
xiv. Sexual Harassment
xv. Violation of Dress Code
xvi. Examination Misconduct
xvii. Infringement of other University Regulations
xviii. Any other offence that is, in the opinion of the SDC considered to be contrary to what the University's vision stands for.
xix. Disregard for Cultural Ethics and Ethos

a. Unruly Behaviour

This shall include disorderly behaviour or acts of indiscipline indicating lack of self-restraint. Offences classified under unruly behaviour and the penalties they attract are as categorised below:

i. Crossing of Lawns. Penalty: Letter of warning.
ii. Urinating outside designated areas.
iii. Streaking: This is a quick run, half naked or naked, through a public place within or outside the Halls of Residence. This is not allowed except for approved physical exercise carried out at designated centres.

iv. Brushing of Teeth outside designated area.
v. Hijacking of a private or public vehicle on campus or off campus, under any action of complaints, protest or demonstration.
vi. Use of threat of violence of any kind on anybody in the forms of:
    1) Fighting: This involves any attempt to cause injury or inflict pain on somebody else. Also, causing physical contact with another when the person knows or should reasonably believe that the other will regard the contact as offensive or provocative. (It is not a defence that the person (or group) against whom the physical abuse was directed) consented to, or acquiesced to, the physical abuse
    2) Offences against persons. No student shall threaten, assault, haze or otherwise physically, psychologically, verbally, or in writing by electronic means or otherwise, abuse any other person. This includes but is not limited to, incidents of bias-related acts of assault or abuse, or any incidents of verbal, written, physical, psychological harassment or abuse.
    3) Stalking: No student shall perform any acts that harass, annoy, threaten, intimidate or alarm another person or persons. Examples include but are not limited to repeatedly following such person(s); repeatedly committing acts that alarm or seriously annoy such other person(s) and that serve no legitimate purpose; and repeatedly communicating by mechanical or electronic means, or any form of written communication with such person(s) in a manner likely to harass, intimidate, annoy or alarm.
    4) Illegal detention of people: Penalty: This shall range from suspension for one session to expulsion from the University.
    5) Any other behaviour that may be classified from time to time as unruly behaviour by the University authority. Penalty: This shall range from Letter of Warning to expulsion depending on the gravity of the offence.

b. Indecent Behaviour

The identified acts that constitute indecent behaviour and the recommended punishment for each act are listed as follows:

i. Defecating outside designated areas or any other indecent behaviour: Penalty: Letter of warning. If offence is committed on a second occasion, the offender shall be suspended for one academic session.
ii. Brushing of teeth outside designated areas.
iii. Spitting in public places / Littering of University premises.
iv. Any other behaviour that may be classified as indecent.

c. Vandalism

Willful or malicious damage or destruction of University or private property is not allowed. The student(s) involved shall make full payment for the repair or replacement of damaged or destroyed property.

d. Disorderly Assembly

Students are forbidden from gathering in a manner that disturbs the public peace, incites public alarm, results in violence to a person or property, disrupts the function of the University, interferes with faculty or staff in the performance of their duties, or otherwise brings disgrace or disrepute to the University. Any student who encourages or participates in the formation or prolonging of such

a gathering is subject to immediate suspension from the University for one academic session or expulsion from the University, depending on the gravity of his involvement in the event.

e. Unauthorised Displacement, Use or Damage of University or Private Property

Three possible offences are listed below:

- Unauthorised transfer of personal or University property
- Unauthorised transfer and use of such property.
- Unauthorised transfer, use and damage of such property.

f. Pilfering

This is the unauthorised and habitual removal of small things/items belonging to another person, seemingly of little value. This shall be considered as Stealing as in (g) below.

g. Stealing

This is the unauthorised removal of a property that belongs to another person. Stealing is a criminal offence and may be referred to the Police after the student had first been dealt with according to the Disciplinary Codes in this book. Upon being arraigned in court, the student is automatically expelled from the University. Penalty: Expulsion from the University.

h. Insubordination

This is defined as unwillingness to submit to, or wilful disrespect of, constituted authority.

i. Secret Cult

1) Undertaking/renunciation of Membership: All students shall sign an undertaking denouncing or renouncing (as the case may be) their membership of any secret cult within or outside the Campus. In the event of the discovery of any violation of the clause in the undertaking, such violator shall be expelled from the University forthwith.
2) Membership and Possession of Cult-Related Materials: Since all secret cults have been proscribed, it is an offence to belong to a secret cult on or outside campus or engage in any cult-related activity or be found to be in possession of any cult-related item or material in or outside the Campus.
3) The Definition of Cult-Related Materials points to the following:
    a) Materials such that has DIABOLICAL connotations. These may include but are not limited to: Bracelets, Amulets, Talisman, Occult Rings, Waist beads and bands, and others;
    b) Unconventional clothing materials carrying inexplicable signs and symbols;
    c) Signs and emblems of known cults or secret societies/organisations in Universities/Institutions in Nigeria or elsewhere; and
    d) Body signs such as incisions, lacerations/cuts, piercing/perforations of parts of the body e.g. nose, ear (for males), deep cuts, strange shaping of beards/haircut and others. It is also a contravention of Decree 47 of 1989 to belong to any secret cult on campus. This shall attract summary expulsion from the University such student expelled shall also be subject to be tried by the appropriate organs under the Decree.

j. Damage to University property

This is any wilful damage or destruction of university property or asset either in the halls of residence, Library, Lecture halls, Cybercafé, laboratories or any part of the University premises.

This includes behaviour that destroys, damages, or litters any property of the University, of another institution, or of another person, on University premises or at University-sponsored activities. The punishment of this offence is as stipulated under vandalism.

k. Giving False Identity/Information

Every student is expected to always provide correct and adequate information as and when demanded. Therefore, any wrong or misrepresentation of self for whatever reason with the intent that such information be acted upon as true, is strictly prohibited. Forgery, unauthorised alteration or misuse of any document, record or instrument of identification is prohibited. Also includes withholding material information from the university, misrepresenting the truth before a hearing of the university and making false statements to any university official. The submission of false information at the time of admission or readmission is grounds for rejection of the application, withdrawal of any offer of acceptance, cancellation of enrolment, dismissal or other appropriate disciplinary action. Students are required to conspicuously carry and present valid University identification at all times.

l. Overt Sexual Behaviour

Student overt sexual misconduct is defined as unwelcome acts of a sexual nature committed by a student against another student with or without consent.
This includes but is not limited to:

i. Touching of body of student of opposite sex, directly or through clothing such as patting, pinching, brushing against the body, attempted or actual kissing or fondling and any other inappropriate and/or unwelcome touching or feeling.
ii. Unwelcome sexual remarks about body, clothing or sexual activities and humour or jokes about sex that denigrate women or men in general.
iii. Unwelcome sexual propositions, invitations, or other pressure for sex.

m. Disregard for Spiritual Value and Institution

Penalty: Ranges from 4 weeks suspension to suspension for one session depending on the gravity of the offence.

n. Sexual Harassment

The policy can be found in https://ace.covenantuniversity.edu.ng/sexualharassment.pdf

o. Identification Cards

Students are required to conspicuously carry and present valid University identification cards at all times. Failure to produce the ID card on demand by any University Official shall attract a strong letter of warning. A repeat of violation shall attract 4 weeks' suspension.

p. Examination Misconduct

All cases of Examination Misconduct will attract an EXPULSION penalty.

q. Infringement of Other University Regulations

This refers to any violation of rules and regulations given to students at all and sundry times by the University Management.

4.5.2 Criminal Offences

These are acts that contravene the laws of the land. They are offences that can warrant expulsion and, as such, shall be handled by the law enforcement agents on the recommendation of the SDC. Student(s) involved in this act shall be expelled or given an indefinite suspension pending the outcome of the investigation by the law enforcement agents. A student found guilty shall be expelled from the University. The offences are:

a. Fraud/Forgery
This is when a person makes or presents a false writing, statement or document knowing it to be false with the intention that it be acted upon as genuine. This shall include signing of roll call, class/lecture attendance, Chapel, TMC attendance, etc. or signing for an officer of the University or other persons in authority outside the university with the intent of validating the genuineness of such document e.g. Letters, Certificates, Bank documents, Medical reports, among others.

b. Robbery (Theft)
This is an act of forceful and violent removal of a property that belongs to another person.

c. Burglary
This is an act of forcefully gaining unauthorised access into a building, offices, rooms, enclosure/closet, and related areas such as locker, wardrobe, boxes, safes, cabinet, stores, and others.

d. Assault
This is an act of striking, touching, moving or otherwise applying force of any kind to the person of another directly or indirectly without his consent or with his consent if the consent is obtained by fraud, or as defined by the criminal code of Nigeria.

e. Murder
This is an act where a person unlawfully kills another or the intentional extermination of another person's life as defined by the Criminal Code of Nigeria.

f. Membership of Secret Cult
Membership of any secret cult or society is highly prohibited in the University.

g. Possession of Firearms/Live Bullets or Any Other Complement of a Firearm.
This is the use of arms and ammunition.

h. Arson
This is where a person wilfully sets fire or attempts to unlawfully set fire to any building, part of building, fittings, appliances, offices, room, vehicles or any part of the University premises, etc.

i. Rape
Any person who has or attempts to have an unlawful carnal knowledge of a woman or girl without her consent or with her consent if the consent is obtained by force or by means of threat or intimidation of any kind or by means of false and fraudulent representation as to the nature of the act.

j. Possession and Use of Hard Drugs and Drug Trafficking
This shall include Indian hemp, Cocaine, Heroin, Cannabis and related drugs. Drug trafficking shall include any exchange, dealing, buying and selling of same.

k. Hazing
Whether by omission or commission, no student shall take any action, or create, or participate in the creation of any situation that recklessly or intentionally endangers another person's psychological, mental, or physical health or that involves the forced or expected consumption

of liquor or drugs for the purpose of initiation into or affiliation with any organisation. Examples of hazing activities include, but are not limited to: paddling, branding, tattooing, shaving of hair, or other physical abuse or brutality; activities that involve excessive fatigue and/or stress; verbal and/or psychological abuse that compromises the dignity of any individual. Any student/group of students found in such act shall be expelled from the University.

l. Internet Fraud/Other Hi-Tech Fraud

This shall include breaking or attempting to break or hack into the database of the University or any other Computer System assigned to other persons or offices within or outside the university. This shall also cover such areas as unauthorised transaction or usage via the use of internet services i.e. otherwise known as hi-tech fraud, inclusion or conversion of restricted IP addresses to one's use.

m. Any Other Criminal Offence Committed In/Outside the University.

This shall include any other criminal offence in/or outside the university not herein listed or adjudged to put the University in disrepute. Violation of any of these clauses shall attract outright expulsion from the University.

In addition, the following shall be considered as offences in the University:

a. Smoking

Any student found smoking or is proven to have smoked or in possession of cigarette of any type within or outside the University, shall be expelled from the University.

b. Use of Hard Drugs

i. The use of hard drugs, which includes Indian hemp, cocaine, heroin, cannabis, and others of their kind, is highly prohibited in the University and shall not be found with students during any period of their studentship in the University.

ii. Any student found using hard drugs of any kind or in possession of hard drugs of any kind outside or within the University will be expelled from the University and handed over to the Police for prosecution.

c. Use of Alcohol

Any student found using alcohol or in possession of it either within or outside the University shall be expelled from the University.

d. Immoral Acts

In line with Covenant University's Core Values and extol virtues/ethics, no Covenant University Student should indulge in any act of sexual immorality on or off Campus. Any student found indulging in this act shall be expelled from the University.

4.6 Award of Covenant University Degree

Covenant University has the right to refuse the award of its degree to any student who has exhibited gross acts of misbehaviour in the University. The award of the University's degree is subject to both good academic and behavioural performance of the student throughout his/her period of study. The award of a Covenant University degree is subject to a Student's worthiness in both character and learning. The University reserves the right to withhold certificate for the Award of a degree to a student whom she has not found worthy in character.

CHAPTER FIVE: RESIDENCY GUIDELINES

5.1 INTRODUCTION

Covenant University is a residential campus, with housing provision for its postgraduate (PG) students who meet the requirements for on-campus boarding while studying for their higher degrees in the University. The University provides limited housing for its PG students.

The residential experience in Covenant University is designed to aid the mental and moral development of its students. The residential experience is an attempt to ensure students draw maximally from the serenity of the campus to enhance their personal and academic learning experience in the University. It is also an attempt to ensure focus on the total man development, interpersonal relationships and cultural integration.

All PG students are expected to be fully involved in the activities of the University community and contribute to the development of communal living amongst all levels of residents from roommates, floor-mates, wing-mates to hall-mates. Any behaviour that runs contrary to this expectation of communal living is not tolerated in the University. Students are expected to consciously discourage other individuals from disrupting or interfering with the sense of communal living in the Halls of Residence. It is expected that every PG student of Covenant University will take pride in his/her residential life and care for its peace and tranquillity at all times.

This material contains guidelines specific to the residential living part of a Covenant education. The organ of the University responsible for the administration of the residential guidelines is the Student Affairs under the leadership of the Dean of Student Affairs. All violations of residential guidelines will be handled by disciplinary committee of the University.

The PG Student Halls of Residence at the University are staffed by Hall Officers who understand the ethos of the University. They also possess sufficient maturity and requisite skills to exercise good judgment in the conduct of their roles as custodians of the conduct and culture of the residential life of the PG students. These Hall Officers are supervised by Hall Administrators who in turn are managed by the Dean, Student Affairs. The residency staff are equipped to listen to concerns, resolve inquiries, maintenance issues and coordinate activities that promote communal life within the halls of residence.

5.2 POSTGRADUATE STUDENT RESIDENCY REQUIREMENTS

All full-time PG students who meet the eligibility criteria for accommodation are required to live within the allocated space in the Halls of Residence provided for PG students only. Qualified students are expected to live for the period the allocation remains tenable which could be a minimum of a semester but not more than an academic session per time. The PG students Halls of Residence shall not be for part-time PG students or other students except otherwise stated. It shall also not be expected to accommodate undergraduate students (whether full time or part time). Exceptions to this can only be made with the approval of the Vice-Chancellor. The University does not provide family housing for her students, as all allocations are for students ONLY.

5.2.1 Eligibility for Accommodation

Full-time PG students are expected to make a formal application for a residential space in the Halls of Residence provided for PG students. Attention is given to students who have fulfilled all requirements relating to fee payment, academic registration and completion of all residency agreement forms. All applications for accommodation will be within a time frame and all relevant

documents (proof of academic registration and full payment of fees, completed residency agreement forms) must be attached for onward submission to the Dean of Student Affairs who in turn will communicate to the students, within a reasonable time frame the decision of the University Management.
There are no specialised options for residential allocations except where there are obvious cases for the physically challenged or those with proven and certified medical reasons. PG students may choose to live outside the campus but no one allocated a room has the right to transfer a space in such a room to another student.
Students may terminate their Residency Agreement subject to the conditions stated therein if they have fulfilled the tenure for which the rooms were allocated, withdraw from the University; have been released by the University based on academic or disciplinary reason. (Refer to the Residency Agreement for details).
The University reserves the right to restrict allocation to applicants on the basis of prior or current disciplinary actions.

5.2.2 Residency Requirements

a. Full-Time Postgraduate Students

PG students are not guaranteed rooms in the Halls of Residence. Any room allocation will be based on completion of all forms and subject to available spaces.

b. Part-Time Postgraduate Students

Except otherwise stated and approved by the Vice-Chancellor, all allocations are reserved for full-time PG students.

c. Staff

The Dean of Student Affairs has a complement of full time staff that will serve as Hall Assistants, Hall Officers and Hall Administrators. Residency Staff maintain a work schedule of 24-hours for their respective Halls of Residence. Staff are put on shifts within this 24-hour work schedule. The responsibilities of the residency staff are explicit in separate sections within this document.

d. Special Accommodation Allocation Policy

PG students who wish to request for special accommodation allotment due to a disability, should notify the Dean of Student Affairs with the specific request. Requests on the basis of medical need or situation should also be directed to the Dean of Student Affairs.
Documentation of a disability or medical condition will be required in order to establish the need for a special allocation of accommodation. Documentation must include an evaluation by an appropriate professional and validated by the University Medical Director.
Students seeking special accommodation based on a disability, or requesting some service based on a medical or psychological condition, should notify the relevant officers of the Student Affairs. The final evaluation of the request rests with the University.

5.2.3 Residential Guidelines and Procedures

1. Acceptance of Rules Guiding Peaceful Residence

An allottee of a room in the PG student Halls of Residence must accept the conditions stated in the Residency Agreement, and also consent to abide by the extenuating rules guiding peaceful residency.

2. Conduct in the Halls of Residence

The conduct of all students in the University is hinged on the acceptance and compliance with the Core Values of the University which are Spirituality, Possibility Mentality, Integrity, Capacity Building, Responsibility, Diligence and Sacrifice.

PG students are to ensure that their conduct on campus does not infringe on any rule or regulation established for the undergraduate students, chief of which is that no undergraduate student is permitted to visit the PG Halls of Residence. A PG student, who cannot coexist peacefully with others, after sufficient caution and warning, shall be ejected from the Hall of Residence, in addition to other sanctions.

Every form of indecent behaviour will not be tolerated in the University. Identified acts that constitute indecent behaviour include but not limited to:

a. Defecating outside designated areas;
b. Brushing of teeth outside the room;
c. Littering of University premises;
d. Barricading windows with wood or metal object; and
e. Any other behaviour that may be classified as indecent and may be in direct opposition to the University's core values.

3. Great Silence

The time between 12 midnight and 5am in the Halls of Residence are referred to as THE GREAT SILENCE. Students are expected to restrict movements in the hall to their floors only as they are not permitted to engage in any activity that may disturb other occupants of the Halls of Residence.

4. Noise Level

Noise is not permitted in the Halls of Residence at all. Radios, televisions, stereos, or other noise in the rooms must be kept to a bearable minimal level and not be heard outside a room. This is the expected courtesy room occupants should show to other occupants of the Halls of Residence.

5. Hall/Room Occupancy

Only students allocated to a particular room may live there. Students may be reassigned or consolidated when vacancies exist. The University reserves the right to increase the number of students assigned to a room. Students live in community with the same gender. Students may request for a change of room from the Dean of Student Affairs. Room changes will be granted based on an assessment of the situation and available space. The University reserves the right to move a student from one room to another in the student's best interest or the best interest of other occupants of the room, floor, wing or hall. Students who are admitted as residents into the Halls of Residence are expected to remain in that status throughout the tenure of their residential agreement with the University. The right of a PG student to occupy a room is non-transferrable or sellable. No student is allowed to transfer from one room to another without due written authorisation from the Dean of Student Affairs.

6. Roommate Conflict

Quarrelling, assault and fighting are absolutely forbidden in the Halls of Residence or in any other part of the University. Any contravention of this rule will be punished accordingly. If students experience a roommate conflict and need help, they should contact their Hall Officers or Hall Administrator. Residency staff will help mediate the conflict or refer students to appropriate authorities.

7. Absence from Hall of Residence

The entrance gates and doors to the Halls of Residence are shut by 10pm daily and opened by 5am daily. Students are expected to be vigilant monitors of all activities within their residence as they could be held accountable for incidences that occur.

PG students are expected to notify the Residency officials of their exit from campus and/or absence from the Halls of Residence.

8. Alterations to Students' Residence

PG students are not permitted to paint their rooms or make significant alterations to furnishings placed in the rooms. They are not to tamper with installations in the room, including window treatments. PG students are not to construct lofts, counters/bars, or other types of furnishings. Any writings or markings on the wall ceilings, or doors as a result of posters, bills, and graffiti will be considered as damages and the concerned student will be charged and sanctioned accordingly.

Signs should not be placed on Windows/Doors at any time. Empty or full cans or bottles may not be visible through the windows or on the window panes. Stickers may not be placed on either windows or the doors (inside or outside). Occupants will be subjected to sanctions for the violation of any of these rules.

9. Furnishings

An inventory form must be completed by the occupant of a room before accepting the allocation. All installed and supplied furnishing must remain in the rooms for the period contained in the residency agreement. PG students will be surcharged for missing or damaged furnishings. Common rooms/Lounges are equipped with furniture for the use of all PG students. None of these should be removed for any other purpose other than what it was provided for. Removal of furniture for personal use is not permitted and will be considered as theft if violated.

10. Lounges/Common Rooms

Lounges/Common rooms are situated in each Hall of Residence hall for studying, socialising, meetings, floor programmes, and other activities. Some common rooms are identified as academic resource centres, or kitchenettes. All equipment and furnishings in lounges or common rooms are the property of the University.

11. Access Keys to Allocated Rooms

No PG student is permitted to duplicate the keys allocated to a room. PG students shall only use keys or access cards for spaces they are authorised to enter. If a key is illegally duplicated, the occupants of the affected rooms will be surcharged for and be subjected to disciplinary action. If a student loses the key to an allocated room, the lock on the door will be changed and the student billed for the replacement cost.

12. Maintenance of Rooms and Requests

Every PG Student shall take responsibility for cleaning the room allocated to him/her. All dirt and waste papers should be disposed off properly in the provided bins in the Halls of Residence. The campus keepers will be responsible for the evacuation of such bins at scheduled times.

For all non-emergency requests for maintenance (e.g., light bulbs, broken or missing items), students should fill out the relevant forms domiciled with the residency staff within the Hall of Residence.

13. Cooking

The Halls of Residence was not built with provisions for individual cooking within it. To this end, no PG student/occupant of any of the rooms in the Halls of Residence is permitted to cook within the Halls of Residence. Students are to obtain their meals from the designated eating areas in the cafeteria.

14. Damages

All damages in the University shall be classified as either malicious or accidental. Malicious damage is a deliberate disruptive act of an individual that culminates in the damage of University's properties. Accidental damage is an unintentional act of damage of University's properties. All types of damage are the responsibility of the students allocated to that property and repair or replacement costs will be charged accordingly.

The cost for any damage that occurs in common areas of the Halls of Residence will be shared among all the residents of that particular room, floor, wing or hall as the case may be. Occupants of the Halls of Residence are expected to help curb damages in the common areas by bringing up cases of damage to the residency staff. Students who are found to have high damage bills may have their allocation revoked. The cost for damages is as advised by the Directorate of Physical Planning and Development (PPD) of the University.

15. Safety and Security

It is the responsibility of each student to take care of his/her personal property. Students are advised to register their valuables in the asset registration book in the Halls of Residence and promptly report any loss of items to alert security officials for immediate follow up. Students should lock the doors to their individual rooms when they are not present or when they are sleeping or using the bathrooms. In addition, the University shall bear no financial liability for any loss of personal property.

Owing to the potential danger to life and personal safety, as well as the likelihood of causing damage, students are prohibited from accessing roofs or overhang areas on all student residences and other University buildings and facilities. Students who access roofs will be subjected to disciplinary action.

In addition, possession and use of motorcycles or gas driven vehicles, gasoline, butane or other flammable liquids, barbecue grills (including propane gas grills), firearms, weapons of any type, and explosives are prohibited. Violation of these also attracts disciplinary action.

16. Computer Network Connections

All rooms in the Halls of Residence are equipped with internet connections linked to the University campus network. Students must get themselves acquainted with the University ICT policy. Users of this network must agree to and abide by acceptable computing standards. All forms of online vices such as pornography, gambling, fraud are prohibited in Covenant University.

17. Electrical Appliances

Students must ensure that serious care and attention is given to the use of electrical appliances in their rooms. All appliances must be approved by the University. A list of approved appliances should be sought from the Dean of Student Affairs. Unapproved appliances found in student rooms will be confiscated and may not be returned.

No student is allowed to be in possession of or listening to or watching indecent films, pornographic materials and secular music, either stored directly on the computer, tablets or other mobile devices.

18. Pets
Pets are not permitted in student residences. They are prohibited.

19. Bicycles and Sports Equipment
There is no definite space for bicycles or any other sports equipment. For reasons of safety, bicycles should not be kept in the corridors, stairwells, doorways, lounges, or bathrooms. Bicycles found in these areas will be removed. Likewise, sports equipment (including shoes) may not be left in corridors. No ball playing, throwing of objects or other forms of rough playing is permitted in the student residences.
Gaming Equipment such as pool, ping pong, and foosball tables are not allowed in student rooms. Gaming equipment for student use can be found in the Sports centre or the common spaces for sports.

20. Spiritual Harmony
No instrument, document, property or substance of any form, connoting or purporting to be used for any unauthorised religious practice or activity is allowed in the Halls of Residence and anywhere on the University campus.
Candles or incense, even for decorative purposes, are prohibited in the Halls of Residences. Candles or incense found in any room will attract disciplinary actions.

21. Social Events in Halls of Residence
Students CANNOT entertain or host parties with others in their individual rooms within the Halls of Residence. Should there be a need to host any social event; a formal written approval must be sought from the Dean of Student Affairs. Any violation of this will attract disciplinary action.

22. Commercial Activities
No PG student is allowed to be involved in the sales of commodities in the Halls of Residence. Students are to do their shopping at the designated sales points within the Halls of Residence and the University. Any desire to express enterprise must first, be discussed with the Dean of Student Affairs who will communicate Management's position to the desiring student.

23. Use of Alcohol/Tobacco/Hard Drugs/Prescription Drug
The use or consumption of alcoholic beverages is PROHIBITED in the University. No student is permitted to use alcohol, possess alcohol or be under the influence of alcohol that may have been consumed elsewhere. Consistent with this prohibition, no alcohol is permitted anywhere around the Halls of Residence or within University campus.
No smoking of cigarettes of any type is allowed in the University. PG students are not permitted to use or possess cigarettes, or hard drugs within or outside the University; substance such as (but not limited to) Indian hemp, Cocaine, Heroin, Cannabis, Codeine, and Prescription drug (without proof of prescription from an authorised pharmacist) are prohibited.
When violations of this policy occur, concerned students will be referred for disciplinary action.

24. Guest Policy
Visitors/Guests are individuals who are not authorised occupants of the Hall of Residence. All PG students are required to notify the residency staff of visitor/guest 24-hours in advance. Students are expected to meet with their guests upon arrival at the reception desk of the Halls of Residence and be with them in reception area or the cafeteria. Host occupants must be available when their

guests depart the Halls of Residence area. Guests with vehicles are to use the guest parking lot. Visitors/guest will not be allowed into the Halls of Residence area as from 6pm daily.

PG students are responsible for the behaviour and conduct of their guests and for ensuring their strict compliance with University rules and regulations. Furthermore, students who invite or allow non-occupants to use University property must assume all responsibility for any actions, damages or injuries resulting from the behaviour of the guest. To this end, student must accompany their guests at all times. Guests found unaccompanied are subject to eviction from the Halls of Residence. Should the guests violate or infringe on University rules and regulations, the host or hosts will be subject to disciplinary action for the violations.

Visitors are not expected to get into any of the rooms in the Halls of Residence. There is, therefore, no reason for an occupant of the Halls of Residence to request his/her roommate to leave the room for a guest. Where a guest is unable to exit the campus during a visit, such a guest should use the University Guest House for lodging and not the Halls of Residence. To this end, no occupant is allowed to accommodate overnight any visitor of either sex or any other student (PG or undergraduate) other than the one to whom the room is allocated.
An undergraduate student of the University is also considered to be a visitor/guest and must produce valid exeat permit before being allowed to visit the PG Halls of Residence.
Violations of the guest policy may result in a minimum fine of N10,000, loss of guest privileges, and other disciplinary actions.

25. Sexual Behaviour

Anything that connotes a sexual object in whatever form is prohibited in the University. No occupant of the room in the Halls of Residence is permitted to walk half nude or completely nude in the common or open areas of the Halls of Residence. Public displaying, possessing, viewing and producing pornographic films and photographs are strictly prohibited in the Halls of Residence as well as within the University environment. Any act of lesbianism or homosexuality is forbidden in the University. No act of sexual immorality will be condoned in the Halls of Residence or anywhere on campus. To this end, all PG students are to declare their marital status upon completion of residency agreement forms.

26. Room/Residence Inspections

Resident PG students in the Halls of Residence will be expected to complete the Room Inventory Forms. This is to enable the student verify the condition of the allocated room. This form represents the official record of the condition of the room when the student took possession of it. Upon vacation from the room, the residency staff goes with the occupant to inspect the condition of the room comparative to the original inventory form. Any difference in the condition of the room that is beyond wear and tear will be charged to the occupants of the room.

Residency or maintenance staff may inspect rooms at intervals to check compliance level of occupants with the established policies. Occupants must make themselves available for this exercise as it forms the basis for future decisions. Occupants will be subjected to disciplinary actions for any policy violation.

27. Entry into a Student's Room

Residency staff members may enter a student's room with the student's consent. To protect privacy, students should keep their doors closed and ask visitors to identify themselves before admitting them into the room. If consent is not given, staff members can enter the room if one of the following conditions exists:

a. There is a need for maintenance (e.g. electrical work);
b. There is a need to check occupancy;
c. There is an emergency health problem;
d. There is a need to check for damages;
e. There is a need to investigate possible violations of University policies or code of conduct;
f. There is a need to vacate the building (e.g., holidays, etc.); and
g. Student Search.

A room search will be conducted only when there is a reason to believe that there is a property or evidence within a particular room that is in violation of University policy and/or state or federal law, or material that is needed as evidence in a University disciplinary hearing. The Vice-Chancellor or his representative, Dean of Student Affairs, and Hall Administrator in the Postgraduate Students Hall of Residence are the only University officials who may authorise a search of a student's room. Whenever possible, the search will be conducted in the presence of the student(s) whose room is being searched. Searches will be conducted in the same manner as a standard entry into a student's room; however, all areas of the room may be searched, including locked drawers and suitcases. Items confiscated during a search that are clearly in violation of University policy will be removed from the room and may be used as evidence in a disciplinary hearing. Since these items are part of the disciplinary process, their disposition will be determined by the Office of the Dean of Student Affairs at the conclusion of the process.

The person requesting the search must state the nature of the item he or she is looking for. However, other items found that are clearly in violation of University policy may be confiscated as well. If the student is not present, a letter will be left indicating all items that have been removed from the room.

28. Vacation Periods

Students are expected to vacate their rooms during the Shiloh and end of semester breaks. Students wishing to remain on campus during these periods must request permission in writing from the Dean of Student Affairs, not later than two weeks before vacation date; such requests would be considered on a case-by-case basis, and the UNIVERSITY Management will exercise discretion to grant or deny such requests. Students approved to remain in the Hall of Residence will be charged a daily fee as prescribed by the School of Postgraduate Studies and may be re-assigned to a temporary room during the period. Students are not expected to leave their personal property in the rooms when the halls are shut. The University has no liability for personal property left in students' rooms during vacation periods.

All resident students must vacate their rooms and remove all personal belongings within 24 hours of the end of each semester. Failure to leave the Hall of Residence will subject students to a N500 charge for every hour they remain on campus. All relevant dates are published well in advance in the University calendar to allow for proper planning.

All University policies remain in effect during vacation periods. Additional restrictions will be communicated through the Dean of Student Affairs prior to the start of the vacation period.

CHAPTER SIX: CONDUCTING OF POSTGRADUATE EXAMINATIONS

6.1 Industry Participation in Ph.D. Proposal Defence and Oral Examination

In order to explore the skills and expertise from the industries in advancing Postgraduate research and driving Vision 10-2022, SPS Board at its meeting held on Monday, October 8, 2018, in its wisdom proposed to engage Experts from the Industry to contribute to Ph.D. proposal and oral defence examinations in Covenant University.

The main reason is to improve on the quality of the Ph.D. research work and provide industrial driven-solutions to numerous challenges of our community.

The Board recommends the following:

1. that one (1) industry expert be invited as part of our Ph.D. Proposal defence and Oral examination;

2. only research proposals and thesis related to the relevant industries shall benefit from this initiative;

3. that the HOD shall suggest through the College Deans to Dean, School of Postgraduate Studies the intending experts relevant to the Ph.D. research work.

   The Board of the School of Postgraduate will finally appoint one of such to be invited to the Ph.D. Proposal and Oral Examination.
4. that the University shall provide honorarium to the invited industry expert as may be necessary in line with relevant University policies.

6.2 Guidelines for the Administration of Departmental and College Proposal and Post-field Defence Examinations in Covenant University

On the approval of the date of Departmental and College proposal and post-field defence examinations by the School of Postgraduate Studies, the following guidelines shall be followed for conducting the Examination:

1. There shall be formal notification of the anticipated examination to the University community. Posters containing the details of the examination shall be placed at strategic notice boards in all Colleges at **least seven (7) days** before the defence date. This will assist in notifying and attracting the University community in making constructive contributions towards the examinations.

2. All the postgraduate students in the Department hosting the presentation shall be in attendance as well as other members of staff in the Department. The Departmental Postgraduate Coordinator shall provide the attendance where all the Postgraduate students (PG) are expected to sign. However, if there are conditions that may constrain any PG students, due approval shall be secured from the PG coordinator and the Head of

Department. It is expected that the hardcopy of the PG attendance sheet shall be processed to the School of Postgraduate Studies alongside with other relevant forms. The attendance sheet shall serve as part of the requirements for consideration and approval of further examinations for the Postgraduate students.

3. In the course of the examination, it is expected the examiners and members of other Departments and invitees shall be part of the audience that forms the quorum for the presentation to commence. For College proposal and Post-field examinations, not less than **two-thirds (2/3)** of Postgraduate students and teaching faculty in the Department shall be present. It shall be expected that two representatives from each department within the College shall be nominated to represent their department during the presentation. In addition, representatives from the College PG coordinator shall be expected to be present at the examination.

4. The moderator for the event is expected to be any faculty of the Department who must be a **Ph.D. holder.** The faculty shall anchor the defence examination under the supervision of the Chief Examiner.

5. After the presentation, members of the audience are requested to make comments and ask questions on the presentation. Thereafter, the moderator requests for comments/questions from the panel of examiners starting with the College Examiners, SPS representatives and Chief Examiner (HOD). The candidate under examination is expected to take note of the questions and respond to it as directed by the moderator.

6. After this process, the **co-supervisor and supervisor** are allowed to make their comments/contributions thereafter the HOD who is the Chief examiner shall make the final remarks and brings the examination to a close.

7. The Head of Department (HOD) is expected to process all relevant documents/forms 72hours after the presentation/examination to the School of Postgraduate Studies as stipulated by the University Senate. This condition applies to all Departmental, College Proposal and Post-field defence examinations in Covenant University.

6.3 Guidelines for Proposal and Post-field Defence Presentations

6.3.1 Proposal Stage

Specific Requirements

1) Departmental Proposal Defence for M.Phil/Ph.D and Ph.D

i) The student, under the guidance of his/her supervisors, shall present a Research Proposal seminar in the Department.

ii) All lecturers from the rank of Senior Lecturer in the Department shall be given a copy of the written proposal at least two weeks to the date of the proposal seminar.

iii) Suggested corrections/inputs on the proposal shall be effected by the student to the satisfaction of the Head of Department and the supervisors.

iv) The student is considered ready for the M.Phil/Ph.D College Proposal Defence only after a successful presentation of the proposal in the Department and approval of Panel of Examiners by Senate through the recommendation of the Board of the School of Postgraduate Studies.

2) College Proposal Defence for M.Phil/Ph.D and Ph.D

i) Copies of the proposal shall be forwarded to all the approved examiners by the Head of Department at least two weeks before the date of the proposal defence.

ii) All lecturers in the Professorial cadre at the Student's Department shall also be given a copy of the written proposal at least two weeks to the date of the proposal defence.

iii) Each of the examiners shall submit a written report on the proposal to the Dean, SPS.

iv) The reports shall be forwarded to the Head of Department for the student to effect correction on the written proposal before the date of the proposal defence. The Head of Department and student's supervisors shall ensure that the corrections are satisfactorily effected.

v) The student shall present a proposed research topic to the examiners and other members of the University Community.

vi) The SPS representative shall be physically present at the proposal defence (not by proxy). Absence of the SPS representative renders the proposal defence invalid.

vii) All other approved examiners shall be present at the proposal defence. In the event of absence of any of the examiner, the Head of Department shall inform the Dean, SPS. The absence of only one examiner, save the SPS representative, shall not void the outcome.

viii) The result of the examination shall be a consensus opinion of the panel of examiners.

ix) The signed report of proposal defence shall reach the School of Postgraduate Studies within 72 hours after the examination.

x) The Board of the School of Postgraduate Studies shall consider the report and recommend same to the Senate of Covenant University for approval.

6.3.2 Post-Field Stage

1) **Departmental Post-Field Defence**:

i) The Head of Department, in consultation with the student's supervisors, shall after a satisfactory completion of the field work fix a date for Departmental post-field seminar not earlier than 3 months after the proposal defence.

ii) All lecturers from the rank of Senior Lecturer in the Department shall be given a copy of the research synopsis (30 - 50 pages) at least seven days to the date of the post-field seminar. The synopsis shall be an abridged Ph.D thesis.

iii) Suggested corrections/inputs on the synopsis shall be carried out by the student to the satisfaction of the Head of Department and the Supervisors.

iv) The student is considered ready for the Ph.D Post-Field defence only after a successful presentation of the Post-field seminar in the Department.

2) **Post-Field Defence**:

i) Copies of the Ph.D Full Thesis shall be forwarded by the Head of Department to all the approved examiners at least two weeks before the date of the post-field defence.

ii) All lecturers in the Professorial cadre in the Student's Department shall be given a copy of the Ph.D synopsis (30-50 pages) at least two weeks to the date of the post-field defence.

iii) All the approved examiners shall submit a written report on the synopsis to the Dean, SPS through the College Coordinator and College Dean.

iv) The reports of the examiners shall be forwarded by the Head of Department to the Dean, SPS. The Head of Department and Student's supervisors shall ensure that the corrections are satisfactorily effected.

v) The SPS representative shall be physically present at the post-field defence (not by proxy). Absence of the SPS representative renders the post-field defence invalid. SPS Representative shall submit a report to the PG School.

6.4 Policy on the Duration of Ph.D Post-field Defence Report

This policy applies to the School of Postgraduate studies examination on PhD post-field defence. Once a post field defence is done at the college level, it is expected that within a 3-month period, all queries /corrections raised during the defence shall be effected and the candidate proceeds to assessment stage.

In the event the candidate exceeds the three months period, the examination shall be conducted again to fully capture any new change(s) that might have caused the delay beyond the stipulated time. Failure of the candidate to complete the corrections after the second attempt may result in failing the examination and as such, the candidate cannot proceed to the next stage of the PhD research.

CHAPTER SEVEN: CApIC-ACE PROGRAMME CURRICULUM

7.1 BIOCHEMISTRY

7.1.1 Introduction

The Department of Biochemistry offers Master's in Biochemistry (M.Sc.), M.Phil./Ph.D. and Ph.D. programmes with areas of Specialisation in Enzymology and Protein Chemistry, Membrane Biochemistry, Molecular Biology and Biotechnology, Food and Nutritional Biochemistry, Clinical Biochemistry, Industrial Biochemistry, Pharmaceutical and Medicinal Plant Biochemistry and Environmental and Biochemical Toxicology in an intellectually and academically thought-provoking environment. The programmes takes pride in the friendly student-faculty relationship it provides and in its preparation of students for successful careers in industries, government and academia. The Department has functional and well-equipped teaching and Postgraduate laboratories with competent and highly experienced postgraduate board members, which comprises five full Professors, one Senior Lecturer, two Lecturer I and two lecturer 2 -cadre faculty and all are holders of Ph.D. degree.

Vision of the Programme

The Vision of the Programme is to be a leading, world-class academic programme committed to raising a new generation of graduate leaders in the field of Biochemistry and Molecular Biology.

Mission of the Programme

The Mission of the Programme is to create knowledge and restore the dignity of black man through the use of the tools of Science as embodied in our Curriculum to train graduate students who will be expert thinkers, skilful, intellectually resourceful and entrepreneurially self-dependent.

Philosophy of the Programme

Biochemistry is the study of the molecular and genetic bases of cellular processes. The philosophy of the postgraduate programme in Biochemistry is to give the graduate students opportunity to develop their intellectual capacity in the field of Biochemistry and Molecular Biology through in-depth training in theoretical knowledge and practical skills in Biochemistry, Molecular Biology, Genetics, Biochemistry of Macromolecules and elective courses in the various areas of Specialisation. The programme has modern, well-equipped research laboratories and supporting facilities, which offer outstanding opportunities for cutting-edge research. Our faculty conducts research to increase current knowledge of the biochemical and molecular mechanisms of cellular processes and help to guide graduates on the choice of research Specialisation and mentors. The University centre for learning resources is ranked among the top research libraries in Africa with a large collection of research journals and online resources in all areas of biological and molecular sciences. Many of our graduate students go ahead to pursue careers in academia, biotechnological and pharmaceutical companies, government, medicine, or research institutes. Our mission is to produce well trained, enquiry minded, expert thinkers and entrepreneurially self-dependent graduates who will expand the frontiers of knowledge in their areas of Specialisation, provide solutions to societal problems and make developmental impacts on their communities.

Aim of the Programme

The aim of Biochemistry Programme is to create knowledge and restore man's dignity through a Human Development concept of the Total Man, employing innovative, leading edge, teaching and learning methods that would assist our graduates to be very relevant in the production processes

Objectives of the Programme

The main objectives of the postgraduate programme are to:

i. produce graduates with in-depth theoretical knowledge, up-to-date analytical techniques and expertise in basic and applied fields of Biochemistry and molecular biology;
ii. produce highly skilled graduate manpower in biochemistry and molecular biology for the nation's health, agricultural and industrial sectors, and other relevant government agencies;
iii. produce intellectuals who are capable of pursuing academic and/or research careers in tertiary institutions, research institutes and international educational/ research-based organizations; and
iv. produce entrepreneurs and employers of labour in relevant product and service industries.

Table I: List of Postgraduate Board Member

S/N	Name	Qualifications	Status	Areas of Specialisation
1	Prof. O. O. Ogunlana	B.Sc., M.Sc., Ph. D	Professor/HOD	Clinical and Toxicological Biochemistry, Medicinal Plants, Public Health
2	Prof. S. N. Chinedu	B.Sc., M.Sc., Ph.D.	Professor	Enzymology and Biotechnology; Public Health
3	Prof. E. E. J. Iweala	B.Sc., M.Sc., Ph.D.	Professor	Pharmaceutical and Nutritional Biochemistry; Public Health; Oncology;
4	Prof. A. H. Adebayo	B.Sc., M.Sc., Ph.D.	Professor	Pharmacological Biochemistry/ Toxicology/ Medicinal Plant/Phytochemistry
5	Prof. I. S. Afolabi	B.Sc., M.Sc., Ph.D.	Professor	Food and Nutritional Biochemistry/ Phytomedicine
6	Dr. S. O. Rotimi	B.Sc., M.Sc., Ph. D	Senior Lecturer	Nutritional and Clinical Biochemistry
7	Dr. O. E. Omotosho	B.Tech, M.Tech, Ph.D.	Lecturer I	Physical, Functional Food/Nutritional Biochemistry/Biotech
8	Dr. T. M. Okuboyejo	B.Sc., M.Sc., Ph.D.	Lecturer I	Pharmacology/ Chemotherapy
9	Dr. O. A. Rotimi	B.Sc., M.Sc., Ph.D.	Lecturer II	Toxicology
10	Dr. O. F. Yakubu	B.Tech, M.Sc., Ph.D.	Lecturer II	Pharmacological Biochemistry/ Toxicology/ Medicinal Plant/Phytochemistry

Adjunct Lecturers

S/N	Name	Area of Specialisation	Qualification	Designation	Course(s) Taught
1	Prof. Chinonye Moses	B.Sc., MBA, M.Sc., Ph.D.	Professor	Strategic Management and Entrepreneurship	Entrepreneurial Development Studies (EDS)
2	Dr. Tuesday Owoeye	B.A, M.A, Ph.D.	Senior Lecturer	Languages	Total Man Concept (TMC)

Degree Nomenclature

The postgraduate programmes are designed to offer advanced training in Biochemistry and Molecular Biology leading to the award of the following degrees in Biochemistry:

i. Master of Science (M.Sc.)
ii. Master of Philosophy (M.Phil.)
iii. Doctor of Philosophy (Ph.D.)

7.1.2 Academic Content

Admission Requirements
To qualify for admission into the postgraduate programme, candidates must satisfy the general regulations of the School of Postgraduate Studies for admission into Covenant University, Ota. In addition, candidates must possess the basic entry requirements for the programmes as follows:

A. Master of Science (M.Sc.) Degree
To qualify for admission into the M.Sc. degree programme in Biochemistry, candidates must possess:

i. Five credit passes including English Language, Mathematics and any of three from the following: Biology, Chemistry, Health/General Science, Food and Nutrition Science, Agricultural Science and Physics subjects at 'O' Level (WASC, NECO or equivalent); and
ii. A B.Sc. degree in Biochemistry or related disciplines with at least second class honours, lower division (2^2) from Covenant University, Ota or any other recognised University.

B. Master of Philosophy (M.Phil.) Degree
To qualify for admission into the M. Phil. degree programme in Biochemistry, candidates must possess:

i. Five credit passes including English, Mathematics and any of three from the following: Biology, Chemistry, Health/General Science, Food and Nutrition Science, Agricultural Science and Physics subjects at 'O' Level (WASC, NECO or equivalent).
ii. A B.Sc. degree in Biochemistry with at least second class honours, upper division (2^1) from Covenant University, Ota or any other recognised University OR
iii. M.Sc. degree in Biochemistry with a CGPA of 3.0-3.99 on a 5-point scale or 50-59% average score from Covenant University, Ota or any other recognised University.

C. Doctor of Philosophy (Ph.D.) Degree

To qualify for admission into the Ph.D. degree programme in Biochemistry, candidates must possess:

i. Five credit passes including English Language, Mathematics and any of three from the following: Biology, Chemistry, Health/General Science, Food and Nutrition Science, Agricultural Science and Physics subjects at 'O' level (WASC, NECO or equivalent).
ii. M.Sc. degree in Biochemistry with a CGPA of at least 4.0 on a 5-point scale or 60% average score from Covenant University, Ota or any other recognised University OR
iii. M.Phil. degree in Biochemistry with a CGPA of at least 3.5 on a 5-point scale from Covenant University, Ota or any other recognised University.
iv. Candidates on the M.Phil. programme can be converted into the Ph.D. programme after successfully completing the M. Phil. course work with a CGPA of at least 4.00. They are expected to demonstrate adequate intellectual capacity, maturity and effective decision-making and problem-solving potentials.

7.1.3 Areas of Specialisation

The areas of Specialisation and research interests include:

i. Enzymology and Protein Chemistry
ii. Membrane Biochemistry
iii. Molecular Biology and Biotechnology
iv. Food and Nutritional Biochemistry
v. Clinical Biochemistry
vi. Industrial Biochemistry
vii. Pharmaceutical and Medicinal Plant Biochemistry
viii. Environmental and Biochemical Toxicology
ix. Immunochemistry and Radiation Biochemistry
x. Molecular Oncology

7.1.4 Duration of Programme

7.1.4.1 Master's Degree Programme

i. Full-time: A minimum of three (3) semesters and a maximum of four (4) semesters.

7.1.4.2 Master of Philosophy/Doctor of Philosophy (M.Phil./Ph.D.)

i. Full-time: The duration of the programme shall be two (2) semesters of coursework and four (4) semesters of doctoral research provided the candidate demonstrate ability to transfer into the Ph.D. research. The candidates will be required to submit a thesis at the end of the programme.
ii. Part-time: A minimum of eight (8) semesters and a maximum of ten (10) semesters.

7.1.4.3 Ph.D. Programme

i. Full-time Ph.D. Biochemistry degree programme shall last for a minimum of six (6) Semesters and maximum of eight (8) semesters. This includes one (1) semester of coursework and five (5) to seven (7) maximum semesters of research.
ii. Part-time: A minimum of eight (8) semesters and a maximum of ten (10) semesters

7.1.5 Graduation Requirement

The candidate must satisfy all conditions stipulated in the regulations of the School of Postgraduate Studies of Covenant University for the award of postgraduate degrees. In addition, candidates must fulfill the requirements for the degrees as follows:

A. Master of Science (M.Sc.) Degree

The M.Sc. degree programme in Biochemistry is a full-time intensive programme with a minimum duration of three (3) semesters. To obtain the M.Sc. degree in Biochemistry, candidates must:

a) Register and pass a minimum of **39** units from the 800 level courses made up as follows:
   i. 23 units of Compulsory Departmental courses
   ii. 2 units of Compulsory University courses
   iii. 6 units of research project.
   iv. At least 8 units of elective courses.
b) Present at least 2 seminars
c) Produce and defend a research report of the research project.

B. Master of Philosophy (M.Phil.) Degree

The M.Phil. degree programme in Biochemistry is a full-time intensive programme with a minimum duration of four (4) semesters divided into two (2) semesters of coursework and two (2) semesters of research.

To obtain the M. Phil. degree candidates must:

a) Satisfy a minimum of **44** units from the 900-level made up as follows:
   i. 27 units of Compulsory Departmental courses
   ii. 2 units of Compulsory University courses
   iii. At least 15 units of elective courses.
b) Present at least 3 seminars
c) Candidates who qualify for conversion into the Ph.D. programme after M. Phil. course work are not required to do any Ph.D. coursework.

C. Doctor of Philosophy (Ph.D.) Degree

The Ph.D. degree in Biochemistry is a full-time programme with a minimum of six (6) semesters. The first semester is devoted to course work while the remaining period is for intensive research in the candidate's area of Specialisation. To obtain the Ph.D. degree, candidates must:

a) Satisfy a minimum of **38** units from the 900-level made up as follows:
   i. 27 units of Compulsory Departmental courses
   ii. 2 units of Compulsory University courses
   iii. At least 9 units of elective courses.
b) Present at least 3 seminars
c) Produce and defend a thesis distributed as follows:
   i. Proposal Defence 3 units
   ii. Post-field Defence 3 units
   iii. Thesis Oral Defence 6 units

Table 2: Graduation Requirements

Degree Programme	Compulsory University Courses	Compulsory Departmental Courses	Elective Courses	Research Project	Total Units
M.Sc.. Degree	2	23	8	6	**39**
M. Phil. Degree	2	21	15	12	**48**
Ph. D. Degree	2	21	3	12	**36**

7.1.6 Examination Requirements

Coursework

a. For all postgraduate coursework, the minimum pass score shall be 50 %; continuous assessment shall constitute not less than 30% of the examination for each course;
b. Any student who fails in any course, shall repeat such a course; and
c. Any student whose Cumulative Grade Point Average (CGPA) falls below 3.00 at the end of 2 consecutive Semesters shall be required to withdraw from the programme.

The scoring and grading of courses shall be as follows:

Marks	Letter Grades	Grade Points
70 and Above	A	5
60-69	B	4
50-59	C	3
0- 49	F	0

Thesis/Dissertation

A panel of examiners shall be constituted to orally assess a thesis or dissertation according to University regulations, nonetheless, the examination shall be guided by the following:

a. Postgraduate Diploma Project Report: An external examiner shall read and grade the report. The final grade for the project report shall comprise the average of the separate grades of an internal assessment process and the external examiner's assessment.
b. Master Thesis: The minimum composition of the examination panel shall comprise:
    i. External Examiner;
    ii. Head of Department;
    iii. Supervisor;
    iv. Co-supervisor (if any); and
    v. Faculty members of the Departmental Postgraduate Board.

Note that all master's degree programmes shall be subject to external examination and moderation.

a. Ph.D. Thesis: The minimum composition of the examination panel shall comprise:
    i. External Examiner;
    ii. Head of Department who must be a Ph.D. holder;
    iii. Supervisor;
    iv. Co-supervisor;

v. One other member of the Department who is not below the rank of a Senior lecturer or an academic staff from a related Department within the Faculty who must be a Ph.D. holder; and
vi. A representative of the Board of the School of Postgraduate (PG) Studies.

Graduation

For the PG programmes, classification of certificates shall be based on the following:
CGPA 4.50 - 5.00 ---------- Distinction
4.00 - 4.49 ---------- Credit
3.50 - 3.99 ---------- Merit
3.00 - 3.49 ---------- Pass
2.99and below --------- Fail

A. Course Structure

Table 3: Course Requirements for M.Sc. Biochemistry

	Alpha Semester			**Omega Semester**			
	Course Code	**Course Title**	**Units**	**Course Code**	**Course Title**	**Units**	
Compulsory University Courses	TMC811	Total Man Concept	1				
	EDS811	Entrepreneurial Development Studies	1				
			2				**2**
Compulsory Departmental Courses	BCH811	Advanced Biochemical and Molecular Biology Techniques	3				
	BCH814	Advanced Enzymology II	3	BCH822	Advanced Intermediary Metabolism	2	
	BCH815	Food and Nutritional Biochemistry	2	BCH823	Bioinformatics I	2	
	BCH831	MSc Seminar	2	BCH824	Advanced Molecular Biology	2	
	BCH833	ICT and Research Methodology	2	BCH826	Advanced Clinical Biochemistry	3	
	BCH834	Biostatistics	2	BCH829	Research Project	6	
			14			**15**	**29**
Elective Courses	*Note: Choose **4** units from these Electives*			*Note: Choose **4** units from these Electives*			
	BCH816	Advanced Biochemical Toxicology	2	BCH825	Advanced Industrial Biochemistry	2	
	BCH817	Advanced Immunochemistry	2	BCH827	Advanced Tissue Biochemistry	2	
	BCH818	Hormonal Biochemistry and Signal transduction	2	BCH828	Medicinal Plants	2	
	BCH819	Forensic Biochemistry	2	BCH841	Biochemistry of Parasites and Viruses	2	
	BCH832	Emerging topics in Biochemistry and Molecular Biology	2	BCH842	Advanced Membrane Biochemistry	2	
	BCH835	Introductory Cancer Biology	2	BCH843	Cancer Biochemistry and Pharmacology	3	
	BCH836	Biochemical Reasoning	1				

			4			**4**	**8**
			20			**19**	**39**

Table 4: Course Requirements for M.Phil. Biochemistry

	Alpha Semester			**Omega Semester**			
	Course Code	**Course Title**	**Units**	**Course Code**	**Course Title**	**Units**	
Compulsory University Courses	TMC911	Total Man Concept	1				
	EDS911	Entrepreneurial Development Studies	1				
			2				**2**
Compulsory Departmental Courses	BCH911	Advances in Macromolecules and Intermediary Metabolism.	3	BCH941	Proposal Defence	3	
	BCH912	Comparative Biochemistry of Living Organisms	3	BCH942	Post-field Defence	3	
	BCH931	Ph.D. Seminar I	3	BCH943	Oral Defence	6	
	BCH932	Ph.D. Seminar II	3				
	BCH935	Recent ICT technique and Research methods	3				
			15			**12**	**27**
Elective Courses	***Note:*** *Choose **3** units from these Electives*			***Note:*** *Choose **12** units from these Electives*			
	BCH913	Advances in Enzymology	3	BCH921	Radiation Biochemistry	3	
	BCH914	Environmental and Biochemical Toxicology	3	BCH922	Biochemical Reaction Mechanisms	3	
	BCH915	Advanced Microbial Biochemistry	3	BCH923	Genetic Engineering	3	
	BCH916	Neurobiochemistry	3	BCH924	Selected Topics in Biotechnology	3	
	BCH917	Advanced Food & Nutritional Biochemistry	3	BCH925	Advances in Membrane Biochemistry	3	
	BCH933	Topics in Cancer Research	3	BCH926	Advanced Plant Biochemistry	3	
	BCH934	Advanced Protein Biochemistry	3	BCH927	Biological Data Science	3	
	BCH936	Ph.D. Seminar III	3	BCH928	Experimental Cancer Biochemistry	3	
			3			**12**	**15**

			20			**24**	**44**

Table 5: Course Requirements for Ph.D. Biochemistry

	Alpha Semester			**Omega Semester**			
	Course Code	**Course Title**	**Units**	**Course Code**	**Course Title**	**Units**	
Compulsory University Courses	TMC911	Total Man Concept	1				
	EDS911	Entrepreneurial Development Studies	1				
			2				**2**
Compulsory Departmental Courses	BCH911	Advances in Macromolecules and Intermediary Metabolism.	3	BCH941	Proposal Defence	3	
	BCH912	Comparative Biochemistry of Living Organisms	3	BCH942	Post-field Defence	3	
	BCH931	Ph.D. Seminar I	3	BCH943	Oral Defence	6	
	BCH932	Ph.D. Seminar II	3				
	BCH935	Recent ICT Technique and Research Methods	3				
			15			**12**	**27**
Elective Courses	***Note:*** *Choose **9** units from these Electives*						
	BCH913	Advances in Enzymology	3	BCH921	Radiation Biochemistry	3	
	BCH914	Environmental and Biochemical Toxicology	3	BCH922	Biochemical Reaction Mechanisms	3	
	BCH915	Advanced Microbial Biochemistry	3	BCH923	Genetic Engineering	3	
	BCH916	Neurobiochemistry	3	BCH924	Selected Topics in Biotechnology	3	
	BCH917	Advanced Food & Nutritional Biochemistry	3	BCH925	Advances in Membrane Biochemistry	3	
	BCH933	Topics in Cancer Research	3	BCH926	Advanced Plant Biochemistry	3	
	BCH934	Advanced Protein Biochemistry	3	BCH927	Biological Data Science	3	
	BCH936	Ph.D. Seminar III	3	BCH928	Experimental Cancer Biochemistry	3	
			9			**0**	**9**
			26			**12**	**38**

7.1.6 Course Description

7.1.6.1 M.Sc. Courses

EDS811 - Entrepreneurial Development Studies VIII (1 Unit)
Introduction, Historical Background, Definition of Entrepreneurship/Entrepreneur, Theories, Types and Characteristics; Idea generation, Opportunity Scouting and Exploitation; Environment of Entrepreneurship/Factors that Influence Successful Entrepreneurship; Entrepreneurs and Health Issues; The Concept of Intrapreneurship and Human Capital; Capital Knowledge, ICT and Entrepreneurship; Creativity, Innovation and Sustainable Entrepreneurship; Wealth Creation and Waste Recycling Process; Marketing and Entrepreneurial Marketing; Financing SMEs in Nigeria- a Review of formal and informal financing; Characteristics, Policy/Theoretical Framework and Challenges of Women Entrepreneurship; Social Evidences of Entrepreneurship and Ethics; Academic Entrepreneurship, Intellectual Property and R&D; Feasibility Report and Business Plan.

TMC811 - Advanced Studies in Life Skills, Strategies and Principles I (1 Unit)
Introduction; Man as a Tripartite Being (Body, Soul and Spirit); Self-Discovery and the Making of a Total Man; Integrity and Character Development; Biographical Studies; Introduction to Leadership Development; Christian Work Ethics; Vision Building; Leadership Virtues and Dispositions.

BCH811: Advanced Biochemical and Molecular Biology Techniques (3 Units)
Principles and application of chromatography (TLC, HPLC, filtration and ion exchange). Electrophoresis (High voltage). Isoelectric focusing. Spectrophotometry. Atomic absorption spectroscopy, NMR spectroscopy, Flourimetry emission, ultra-centrifugation, isotopic techniques, immunochemical techniques. Tissue preparations (slices homogenates, whole cells, cell cultures) and subcellular organelles. Isolation and purification of DNA and protein, DNA cloning, Real time PCR.

BCH814: Advanced Enzymology II (3 Units)
General review of enzyme and properties; definition, history, functions, properties classification and nomenclature. Vitamins and Coenzymes; Cofactors; Metalloproteins containing Zn, Fe, Co, Cu and Mo etc. Active sites of enzymes. Mechanisms of enzyme catalyzed reactions. Chemistry of enzyme catalysis Effects of temperature, pH, ions and inhibitors on enzymes. Enzyme kinetics; Equilibrium and Steady-state enzyme kinetics; Michealis-Menten and Briggs-Haldane's equation. Estimation of kinetic parameters; Km, V_{max}, K_i, etc., Transient kinetic methods. Regulatory enzymes. Molecular models for allosterism (MWC and KNF models of allosteric regulation). Multi-enzymes complexes. Enzyme assays. Criteria for determining purity of enzymes. Isolation, purification and characterisation of enzymes. Applications of enzymes in industry, health, agriculture, etc. Regulation of enzyme activity and synthesis. Recent advances in enzymology.

BCH815: Food and Nutritional Biochemistry (2 Units)
Food chemistry (characteristics of nutrients, food composition, food science and technology). Food Biochemistry (functions of nutrients, factors affecting bioavailability of nutrients, dietary fibers, etc). Chemical and biochemical determinants of food quality, etc. Assessment of nutritional status. Food availability or Securities. (Factors affecting them and how to combat them). Principles of Human Nutrition (concept of balanced diet nutrient and energy requirements, etc.) Malnutrition diseases – (Biochemical bases of selected macro and micro nutrient deficiency disease, control of nutrient deficiency in population). Food toxicology and sensitivity. Current topics on nutritional research. Nutrition in infants, aged and pregnancy. Experimental nutrition (principles, uses, etc.)

BCH816: Advanced Biochemical Toxicology (2 Units)

Toxicants in food, beverages, water and atmosphere pollutants of environment. Poisons of Biological origin, chemistry of toxicants. Structure in relation to toxicological effects. Effects of toxicants on membranes, enzymes, nucleic acids and other cellular molecules. Radiation biology, toxicity; Mutagenicity; carcinogenicity. Metabolism of foreign compounds and xenobiotics, enzyme induction and inducers. Recent advances in biochemical toxicology.

BCH817: Advanced Immunochemistry (2 Units)

Topics covered; Maturation, activation and regulation of lymphocytes; Immunogenetics; CD molecules and cytokines; signalling in cells of the immune system; Nature of antigens, preparation and purification of antigens. The structure and function of antibody. Antigen – antibody interaction, lymphocytes, complement system transplantation and tumor immunogens. Antigen-antibody interactions; Immunological responses to specific pathogens and pathogen evasion strategies; MHC, cytokine polymorphisms and susceptibility to disease; Mucosal immunity and oral tolerance; Current techniques in immunochemistry e.g. immunohistochemistry, FACS analysis, NK cell assays etc.

BCH818: Hormonal Biochemistry and Signal transduction (2 Units)

Neutral control of hormonal secretion, hormonal receptor, mode of action and control of metabolism by all the classes of hormones. Recent advances in studies of hormones. Pathophysiology of the hormones. Calcium as a second messenger.

BCH819: Forensic Biochemistry (2 Units)

Organisation and services of the Crime Laboratory, Processing the Crime Scene, Legal Issues at the Crime Scene/good lab techniques and safety, Types of Physical Evidence, Significance of Physical Evidence, Morphology of Hair, Identification and Comparison of Hair, Types of Fibers, Comparison and Preservation of Fiber Evidence, Forensic Examination of Paint, History of Fingerprints, Classification of Fingerprints, Methods of Detecting Fingerprints, Preservation of Developed Prints, The Nature of Blood, Forensic Characteristics of Bloodstains, Stain Patterns of Blood, Principles of Heredity, DNA, DNA typing, Gel Electrophoresis, The Combined DNA Index System (CODIS), The Collection and Preservation of Biological Evidence for DNA analysis, Drug Identification, Collection and Preservation of Drug Evidence, Chemical Analysis of Drugs using Spectroscopy.

BCH822: Advanced Intermediary Metabolism (2 Units)

Review of intermediary metabolism of carbohydrates, proteins, lipids and nucleic acids. Degradation pathways of the major biomolecules, inter-conversion and biosynthesis of the precursors of the various biomolecules. Regulation of biochemical processes, integration and metabolic pools. Methods of investigation of metabolism. Disorders of metabolism.

BCH823: Bioinformatics I (2 Units)

Didactic: Historical perspectives, definitions, impact of genomics on problems in molecular and cellular biology; sequence driven and data driven problems. Overview of databases and visualisation tools for genomic data. Next-generation sequencing data structure and processing.

Practical: Introduction to Linux and R for genomic data analysis: Downloading BLAST and ClustalW via FTP, and installing and running BLAST and ClustalW for sequence similarity, sequence alignment and multiple sequence alignment. Prediction of gene and gene structure using homology-based model and alignment of mRNA to genomic DNA sequence. Processing, normalisation and differential gene expression analysis of RNA-seq data in R.

BCH824: Advanced Molecular Biology I (2 Units)
Review of pathway of gene expression. Polynucleotide hybridisation and application. Gene mapping and gene organisation. Control of gene expression and differentiation. In-vivo gene transaction and rearrangement. Techniques of *in vivo* gene manipulation. Peptide Synthesis Core, Genetic Variation and Evolution, The Human Genome, Expression Profiling, Proteome Families, Structural Proteomics, Gene Finding/Gene Structure, Protein function and annotation, nanotechnology.

BCH825: Advanced Industrial Biochemistry (2 Units)
Enzyme biotechnology (isolation, production and immobilization of enzymes), enzyme reactors; the direct use of isolated enzymes from microbial plant and other sources as well as enzymes in intact organisms in brewery, food, pharmaceuticals, detergents, Agriculture, environment energy, medicine, and chemical industries. Fermentation pathways in different microorganisms and control of fermentation products in industrially important microorganisms. Microbial transformation of drugs. Raw materials biochemistry: science/technology of large-scale (commercial) production of food additives, natural products, antibiotics, etc from plants, animals and microbes for the industry. Formulation of animal feeds from local sources, quality control methods. Legislation relating to developed products. Industrial analytical biochemistry: quality control and assurance; the public analysts; analytical kits RD&P.

BCH826: Advanced Clinical Biochemistry (3 Units)
General treatment of basic disease processes. Body fluid homeostasis. In-born errors of metabolism, the chemical pathology of the gut, liver, kidney and nervous system, the physiology and biochemistry of endocrine gland and haemoglobins; clinical enzymology; the chemical pathology of aging; immunochemistry and immunology; recent advances in clinical biochemistry.

BCH827: Advanced Tissue Biochemistry (2 Units)
Biochemistry of some selected tissues such as muscles, adipose tissue, alimentary system, liver, skeletal, reproductive tissues eyes and ear tissues; comparative and evolutionary basis of biochemistry of tissues. Interdependence of various tissues. Detoxification and excretion of tissues. In-vitro studies of intermediary metabolism using organs, tissues and tissue fragments. Tissue culture techniques. The biochemistry of abnormal tissues. Membrane biochemistry. Recent advances in tissue biochemistry.

BCH828: Medicinal Plants (2 Units)
Identification of local medicinal plants. Qualitative and quantitative analysis of local medicinal plants. Extraction and purification of active ingredients. Efficacy of active ingredients on various diseases peculiar to Africans.

BCH829: Dissertation Research (6 Units)
Each candidate shall carry out an independent research project on an approved biochemical problem under the supervision of an approved supervisor. A well-written bound Dissertation shall be submitted.

BCH831: Dissertation Seminar (2 Units)
Candidates are required to present two seminar papers for the M.Sc. programme and submit a well-written report paper on an approved topic.

BCH832: Emerging topics in Biochemistry and Molecular Biology (2 Units)

Current topics on various aspects of Hormones, immunochemistry, oncology, brain biochemistry, monoclonal antibodies, molecular biology, public health, genetic engineering, nutrition, emerging disease, drug development, chemoprevention, food processing and preservation etc. These may be taught, or seminars given by academic Staff and Students.

BCH833: ICT and Research Methodology (2 Units)

Essentials of Spreadsheets, Internet technology, Statistical Packages, Precision and Accuracy of Estimates, Principles of Scientific Research, Concepts of Hypotheses Formulation and Testing, Organisation of Research and Report Writing, Hypothesis and theory. Types of research. Research design and evaluation; interpretation and inference drawing from biochemical research data. Assimilation and dissemination of scientific information; Effective use of library, scientific publications and materials and other resources; preparation of dissertations or theses, writing of papers for publication in scientific journals, reviews, and conference proceedings. Ethics and integrity in Research. Statistical methods of analysis: probability (binomial, poison and normal), sampling distribution, statistical inferences, comparison, the planning of experiments and sample, regression and correlation and analysis of variance, statistical methods in Biochemistry, Biology and Medicine.

BCH834 Biostatistics (2 units)

Definition, scope and applications. Presentation of data. Overview of measures of central tendency. Chi square test. Scientific writing I. (a) Biostatistics; Population and sample size. Sampling distribution. Research design. Study of some classical papers for experimental design and presentation of data. Normal, Binomial and Poisson distributions. Tests of significance. Students' t-test. Analysis of variance (ANOVA). One-way and two-way ANOVA. Regression Analysis. Simple and multiple regression. Overview of non-parametric tests. Statistical packages; Graphpad Instat, SAS, Epi Info, and SPSS.

BCH835: Introductory Cancer Biology (2 units)

Basic cell structure, function, and dynamics; Cell cycle; Cell division, apoptosis, compartmentalization, transport, motility, interaction, adhesion, regulation, heterogeneity, differentiation and senescence; Angiogenesis; General concept of carcinogenesis (chemical, viral, and physical), metastasis and invasion; Tumor immunology (tumor antigens and immunosurveillance); Stem cell biology and therapeutic approaches.

BCH836: Biochemical Reasoning (1 Unit)

Evaluation and design of experimental biochemistry from available information and data. Analysis, interpretation and inference - drawing from biochemical research data.

BCH841: Biochemistry of parasite and viruses (2 Units)

Analysis of macromolecular structures and metabolic pathways peculiar to selected parasites. Molecular basis of parasite chemotherapy. Biochemistry of host-parasite relationship. Molecular parasitology: Isolation, fractionation and culture of parasites. Comparative metabolic reactions of malarial parasite, trypanosome, and other parasites

BCH842: Advanced Membrane Biochemistry (2 Units)

Models of membrane structure, Characterisation and composition of biological membranes. Lipid-protein interactions. Structure and dynamics of membranes, mechanism of assembly of membranes. Functional aspects of membranes e.g. transport across membranes, membrane receptors, electron transport and oxidative phosphorylation. Membranes in Biochemical research.

BCH843: Cancer Biochemistry and Pharmacology (3 units)

Molecular genetics and cytogenetics of cancer (alterations in proto-oncogenes, tumor suppressor genes, DNA Repair genes etc.); Genes associated with breast and prostate cancer; Epigenetic mechanisms, regulation and alterations in cancer; Signal transduction mechanisms in cancer (including growth factor signalling and transcription control); Basic biochemical pathways and Intermediary metabolism in carcinogenesis, metabolic reprogramming of cancer cells, unique nutrient and energy demands of tumors, molecular mechanisms by which oncogenic signalling pathways alter cellular metabolism; Molecular interventions of biochemical pathways and therapeutic opportunities arising from differences in the metabolism of normal versus tumor cells, metabolic activation of chemical carcinogens; Metabolomics, genomics, transcriptomics, proteomics in cancer etiology, progression, discovery and validation of disease biomarkers and effect of different treatments (drugs, radiation etc.); Biomarkers of cancer disease; Principles of Cancer Therapy and pharmacology, Mechanisms of action and resistance to chemotherapeutic, anti-hormonal, biological modifiers and new drugs (especially medicinal plants); Tumor immunotherapy and cancer vaccines, drug metabolism and toxicity.

7.1.6.2 M. Phil/ Ph.D. Programme

EDS911 - Entrepreneurial Development Studies VIX (1 Unit)

Venture Starter Guide; Venture Creation; Innovate or Die; The Startup Way; Biblical Business Principles; The Business of your Talents and Skills; Entrepreneurial Leadership; Product Development; Deal-Making and Negotiation; Marketing and Selling; After 5pm: When True Work actually Begins; The Gig Economy**.**

TMC911 - Advanced Studies in Life Skills, Strategies and Principles II (1 Unit)

Introduction; Man as a Tripartite Being (Body, Soul and Spirit); The Place of Preparation; Self-Discovery and the Making of a Total Man; Biographical Studies; Self-Management Strategies; Models of Leadership; Multiple Intelligence; Spirituality and Academic Excellence

BCH911: Advances in Macromolecules and Intermediary Metabolism (3 Units)

Recent developments in the knowledge and understanding of the chemistry and molecular structure of alpha-amino acids, proteins, nucleic acids, lipids and carbohydrates; their hierarchical organisation into standard cell architecture. Proteomics, molecular biology and genetic engineering. Recent developments in the knowledge and understanding of the reactions of intermediary metabolic pathways and their regulation and control. Higher animals and microbes only. Current knowledge and understanding of the biochemistry/ molecular biology of aging and senescence. Bioluminescence.

BCH912: Comparative Biochemistry of Living Organisms (3 Units)

An overview of the distinguishing biochemical/molecular biological features underlying the uniqueness of the various classes of living organisms as well as the various tissues/organs of a given organism. Structural bimolecules (cell building blocks and materials), intermediary metabolism (enzymes, coenzymes, carriers, intermediates, regulation and control, etc.), xenobiotic metabolism (mammals only), nutrient requirements, etc. to serve as bases for comparison Emphasis on features that are sufficiently distinguishing to be considered as biomarkers and which could be employed in forensic and diagnostic tests, typing, chemotaxonomy, etc. Mammalian organs/tissues; mammals vs. other vertebrates; man vs. other mammals. Higher plants vs. higher animals; higher plants vs. lower animals. Beneficial animals vs. microbes. Bacteria vs. fungi vs. viral particles vs. prions. Beneficial use of distinguishing features by organisms (e.g. insect-plant interaction, survival, maintenance of biodiversity, etc.) and man (forensic analysis, chemical identification, etc.).

BCH913: Advances in Enzymology (3 Units)

Overview of enzymology; Principles of purification and characterisation of enzymes; Advanced enzyme kinetics; multienzyme system; Chemical equilibria: ligand binding: enzyme kinetics and mechanisms; specific biochemical reaction mechanisms involving coenzymes, regulations of enzyme activity and control mechanisms. Current trends in enzymology including reaction mechanisms and metabolic control. Candidates are expected to present a reviewed topic as seminar on the current developments in enzymology.

BCH914: Environmental and Biochemical Toxicology (3 Units)

Enzyme proteins catalysing the biotransformation of xenobiotics (drugs, carcinogens, and other foreign compounds); their evolutionary significance, genetic polymorphisms, and inter-relationships. The molecular mechanisms of toxicity of selected organic chemicals; implications to human health such as carcinogenesis, teratogenesis and organ toxicity. Recent findings in the following: Sources of Toxicants; Absorption, Distribution, Metabolism and Elimination of Toxicants; Toxicity Testing and Prevention of Toxicity. Recent progress in technological advances in genomics, proteomics and analytical chemistry. New drug targets as applicable in pharmaceutical industry; the need for the early detection of potential toxic side-effects of new chemical entities.

BCH915: Advanced Microbial Biochemistry (3 Units)

General treatment of advances in the fields of microbial systematics, physiology metabolism and genetic membrane processes, biochemical aspects of microbial genetics. Induction of mutations and microbial systems in continuous cultures including the chemical and biochemical aspects. Advanced areas of micro-biosynthesis and microbial chemistry. Chemical and biochemical basis of classification of pathogenic bacteria, mechanism of pathogenicity. Biochemical pathogens of microorganisms. Regulation of activities in microbial cell. Biochemical and engineering aspects of Industrial microbiology.

BCH916: Neurobiochemistry (3 Units)

Chemistry and biochemistry of peripheral and central nervous systems. The biochemistry of nerve impulse generation and synaptic function. Adaptation of the nervous system to environmental factors. Development in neurochemistry and biochemistry, structural and functional factors in neurochemistry, biochemical actions of drug on nervous system. Biochemical aspects of mental and neurological illness, Biochemistry of sleep. Recent advances in neurobiochemistry. Biochemical analysis of memory.

BCH917: Advanced Food and Nutritional Biochemistry (3 Units)

Food chemistry (characteristics of nutrients, food composition, food science and technology). Functions of nutrients, factors affecting nutrient bioavailability, dietary fibers, etc. Chemical and biochemical determinants of food quality, etc. Assessment of nutritional status. Food availability or Security. Malnutrition diseases: biochemical bases of selected macro and micro nutrient deficiency disease, control of nutrient deficiency in population. Current topics on nutritional research. Nutrition in infants, aged and pregnancy. Experimental nutrition (principles, uses, etc.). Recent developments in the knowledge and understanding of nutrients, their biochemical/metabolic functions, mode of translation of metabolic/biochemical functions to ultimate biological function; biochemical/molecular aetiology of diseases of nutrient deficiency and excess. Contemporary issues in nutrition (functional foods; dietry changes and disease; diet therapy of disease; food supplements, Millennium Development Goals, etc.) and their biochemical perspectives.

BCH918: Clinical Immunochemistry (3 Units)

Topics covered; Mechanisms of allergic disease; current advances in allergic disease and treatment; Advances in cancer immunology and cancer diagnostics; Mechanisms of autoimmune diseases and immunotherapy e.g. monoclonal antibody therapy; Gene therapy and immunological disorders; Advances in immunology and infectious diseases; Novel vaccination strategies; Diagnosis and treatment of immunological disorders.

BCH921: Radiation Biochemistry (3 Units)

Types, uses and sources of radiation, measurement and dosimetry; effects of exposure to radiation on cells, living tissues and body systems, including genetic effects, and effects on biologically important molecules. Production of radiation, interactions of radiation with matter, dosimetry ionisation, radiation chemistry, chemistry of projectors, cellular radiobiology, radiation genetics, effects of radiation on biological important molecules. Adaptation effects following chronic exposure to radiation; Radiation exposure and cancer; Methods for detecting DNA damage, chromosomal aberrations, cellular, histological, immunological, and molecular changes caused by exposure to radiation; Radiation protection and safety; Radiobiological basis of radiotherapy, radiation protection and safety. Isotopes in industry, medicine and agriculture, radio ecology. Current topics in radiation Biochemistry.

BCH922: Biochemical Reaction Mechanisms (3 Units)

Fundamental principles. Reactions of the amino and carboxyl groups. Free radical reactions. Oxidation-reduction reactions. Biochemical reaction mechanisms of the Krebs cycle and enzymes of established x-ray crystallography. Mechanisms of toxicological importance, clinical significance, energy of phosphate bonds and integration of metabolism. Mechanisms of biosynthesis of amino acids and nucleic acids. Technologies for investigating reaction mechanism. Recent advances in biochemical reaction mechanisms.

BCH923: Genetic Engineering (3 Units)

Structure and organisation of the genome, Techniques of nucleic acid analysis including purification, amplification and hybridisation. Construction and analysis of recombinant DNA, Enzymes and vectors employed in recombinant DNA technology. Cloning. Introduction to genome editing, genome editing techniques ZFNs, TALENs, and CRISPR-Cas9. Ethical issues on genetic manipulation and genome editing

BCH924: Selected Topics in Biotechnology (3 Units)

Integration of relevant concepts in Biochemistry, Genetics, Microbiology and Food Science that is applicable in industrial processes. Enzyme technology, environmental Biotechnology and

BCH925: Advances in Membrane Biochemistry (3 Units)

Characterisation and composition of biological membranes. Lipid-protein interactions. Structure and dynamics of membranes, mechanism of assembly of membranes. Functional aspects of membranes e.g. transport across membranes, membrane receptors, electron transport and oxidative phosphorylation.

BCH926: Advanced Plant Biochemistry (3 Units)

Techniques of plant biochemistry such as cell fractionalisation structure and function of plant organisation and its responsibility to plant growth including respiration in storage tissues. Fruit development studies on increasing photosynthesis in crop plants. Regulations of crops growth and productivity. Biochemical and genetic control of photorespiration. Respiratory pattern in plants breeding. Influence of herbicides in plant respiration and photosynthesis. Anaerobic respiration, flood and drought tolerance in higher plants. Solar energy conversion in photosynthesis research into medicinal plants (pharmacognosy), the chemical and pharmacological studies on plant extracts. Use of plant extracts in drug preparation. Cultivation of traditional medicinal plants.

BCH927: Biological Data Science (3 Units)

Analysis of next-generation sequencing data (RNA-seq, Whole-genome sequencing and Whole-genome bisulfite sequencing). Mapping and Genome Rearrangement, Gene Fusion Discovery. Identification of

somatic and germline copy number alterations and mutations. Mapping of genetic variant to biological networks. Integration and translation of clinical data.

BCH928: Experimental Cancer Biochemistry (3 units)

The Cancer research process; Animal models in cancer research (choice of an appropriate model, ethical, legal, and technical aspects); Ethical issues in Cancer research (ethical dilemmas in publication and interpretation of data, academic/industry ties; research on stem cells, bioweapons, genetic testing, human subjects, and vertebrate animals); Applications of biostatistics to BIG DATA; Computational genomics; Histochemical techniques; Molecular techniques (Next Generation Sequencing (NGS) technologies); Cellular techniques (cancer cell lines)

BCH931: Ph.D. Seminar I (3units)

Candidates are required to present a seminar papers for the Ph.D. programme and submit a well-written report paper on an approved topic.

BCH932: Ph.D. Seminar II (3units)

Candidates are required to present a seminar papers for the Ph.D. programme and submit a well-written report paper on an approved topic.

BCH933: Topics in Cancer Research (3 units)

Cellular molecular and clinical aspects of cancer; Pathological basis of cancer; Molecular cancer epidemiology, prevention and control (basic science research and applied behavioural, social, and population sciences to reduce cancer risk, incidence, morbidity and mortality, and improve quality of life) ; Health disparities in cancer (biological /genetic/genomic/epigenetic basis for observed cancer susceptibility/response to therapy and unequal burdens of cancer across racial/ethnic populations); Clinical survey of common human cancers (natural history, biology, and treatment); Principles and practices of behavioural science in cancer control (application of social, psychological, behavioural, and translational research from cancer diagnosis to survivorship); Epigenetic mechanisms and environmental impact; Translational bioinformatics and approaches in cancer biology; Infectious diseases/inflammation and cancer; Cancer biomarkers and therapeutics.

BCH934: Advanced Protein Biochemistry (2 Units)

Peptide Synthesis Core, Genetic Variation and Evolution, Expression Profiling, Proteome Families, Structural Proteomics, Protein function and annotation, nanotechnology. Protein Bioinformatics Analysis Core.

BCH935 - Recent ICT Technique and Research Methods (3 Units)

Biochemical reasoning, hypothesis and theory. Types of research. Research design and evaluation; interpretation and inference drawing from biochemical research data. Assimilation and dissemination of scientific information; Effective use of library, scientific publications and materials and other resources; preparation of dissertations or theses, writing of papers for publication in scientific journals, reviews, and conference proceedings. Ethics and integrity in Research. Statistical methods of analysis: probability (binomial, poison and normal), sampling distribution, statistical inferences, comparison, the planning of experiments and sample, regression and correlation and analysis of variance, statistical methods in Biochemistry, Biology and Medicine.

BCH936: Ph.D. Seminar III (3 units)

Candidates are required to present a seminar papers for the Ph.D. programme and submit a well-written report paper on an approved topic.

BCH 941: Ph.D. Proposal Defence (3 units)
Each candidate shall give his/her College Proposal seminar on an approved biochemical problem under the supervision of an approved supervisor/mentor. The seminar shall be evaluated and graded by a panel of examiners.

BCH 942: Ph.D. Post-Field Defence (3 units)
Each candidate shall give his/her Post-field defence seminar on an approved biochemical problem under the supervision of an approved supervisor/mentor. The seminar shall be evaluated and graded by a panel of examiners.

BCH 943: Thesis Oral Defence (6 units)
Each candidate shall produce and submit a thesis of the approved research project, under the supervision of an approved supervisor/mentor, and have the thesis evaluated and graded by a panel of approved Assessors, which will constitute Assessors' evaluation.

7.1.7 Staffing Requirements
Teachers of postgraduate courses, except the PGD, should normally be holders of a Ph.D., provided that those who teach Ph.D. courses are of the rank of at least Lecturer I with Ph.D.

7.1.8 Student Supervision Requirements
The requirements for supervision of postgraduate students shall be as follows:

a. At least one supervisor for each postgraduate student on the masters and the PGD and at least two (2) for the Ph.D. programme shall be appointed.
b. All lecturers qualified to teach postgraduate courses and who are not registered postgraduate students shall be eligible to supervise PGD and Master's programmes. For the Ph.D., supervisors must be of a rank not lower than senior lecturer and must not be registered postgraduate students.
c. A supervisor shall guide a student in his/her studies and the department shall keep a record of the candidate's progress and submit a regular progress report through the Dean to the Board of Postgraduate Studies.
d. A supervisor may be changed where and when necessary subject to the approval of the board of Postgraduate Studies.
e. Where a student does part or all his required courses in another institution, the external supervisor shall only be required to submit a written report on the candidate at the end of the programme. Such a supervisor shall not normally be required to participate in the oral examination of the candidate.

7.2 BIOINFORMATICS

7.2.1 Introduction
The Department of Computer and Information Sciences (CIS) was established in 2002 under the appellation, Department of Computer and Information Technology, when the university commenced its operations. At the time, Computer Science and Management Information Systems were the only programmes run in the department, with Prof. T. S. Ibiyemi as the pioneer Head of the Department. Thereafter, Dr. C. K. Ayo joined the university and became the first substantive Head of Department. Dr. E. F Adebiyi was the Head of Department from 2008-2011. Also, Prof. C. K. Ayo became the Head of Department from 2011-2012 after serving as the Director of Academic Planning Unit. Subsequently, Dr. Nicholas A. Omoregbe assumed the office of the Head of the Department of Computer and Information Sciences (CIS) in 2012 to 2014. Other faculty in the department who served as HOD CIS are Dr. A. A. Adebiyi (2014 - 2016), Dr. O. O. Oladipupo

(2016 - 2017), and Prof. V. C. Osamor (2017 – date). All the faculty mentioned above are now full professors, except Dr. O. O. Oladipupo who is currently an associate professor. The Department which started with 13 faculty members now has 31 faculty members, out of which 14 are senior lecturers and currently involved in teaching at the postgraduate level. The Department has produced several graduates at B.Sc., M.Sc. and Ph.D. levels.

Currently, the department's research focus includes software engineering and intelligent systems, management information systems, and bioinformatics. The CIS department currently offers degree programmes leading to the award of B.Sc., M.Sc., and Ph.D. degrees in Computer Science (Software Engineering), Bioinformatics, and Management Information Science (MIS), respectively.

7.2.2 Bioinformatics Major

Modern approaches to biological and medical research have created many new opportunities for computer scientists and biologists. One of such approaches is bioinformatics, which is a convergence of two rapidly changing areas of science and technology— computer science and biotechnology (genetics, molecular biology and biochemistry). The Bioinformatics programme of the Department of Computer and Information Sciences (CIS) contributes to the mission of the university by equipping undergraduate and graduate students with the requisite skills needed to solve complex technological problems of modern society and attain different areas in the Sustainable Development Goals.

The curriculum of the Bioinformatics programme of Covenant University is computing-based, and remarkably, since 2004, Covenant University has been a leading institution in the area of biology informatics, otherwise known as Bioinformatics, in STEM. By 2017, 17 M.Sc. and 13 Ph.D. students have been trained under the programme.

Vision of the Programme

The vision of the Bioinformatics programme is to become one of the world's top-rated Bioinformatics programmes; this is in line with the Covenant University vision of becoming one of the first ten universities in the world. Our postgraduate programme at master's and doctoral levels will be competitive for further career development such as faculty appointments, at same or related departments or equivalent industries. We will achieve and sustain a level of M.Sc. and Ph.D. degrees that are competitive with peer departments and which meet college benchmarks.

Mission of the Programme

The mission of the Bioinformatics programme is to produce total graduates empowered with adequate knowledge and skills in the field of bioinformatics, readily relevant in the industry, and entrepreneurially self-dependent. We will also create and disseminate knowledge through research and education in the theory and application of bioinformatics, to better the state and nation, and to equip our students to succeed and contribute to solving various challenges in the society.

Philosophy of the Programme

The philosophy of the Bioinformatics programme involves a broad strategy of human resource development that encompasses educational, cultural, social, political and spiritual development, such that the postgraduates will be able to contribute to the building of national identity and integrity by being sufficiently creative and innovative to seek self-employment in the field of bioinformatics, life sciences and its allied disciplines, or, in the least, be immediately employable. Career opportunities, though not exhaustive, include: Bioinformatics researcher/Principal Investigator, laboratory facilities manager, pharmaceutical research/analysis technician, research data technician and teacher/professor.

Aim of the Bioinformatics Postgraduate Programme

We aim to develop, via this programme, innovative, future-oriented education to perpetually maintain leadership in scientific research, particularly in data science. In addition, the Bioinformatics postgraduate programme in the Department of Computer and Information Sciences seeks to develop manpower with competence in Bioinformatics and produce postgraduates in the field of Computational Biology.

Objectives of the Bioinformatics Postgraduate Programme

The objectives of the Bioinformatics programme are to:

i. develop manpower with the skills and knowledge needed to develop bioinformatics tools and scientifically manage massive biological data for the needs of a rapidly advancing and challenging field of the society;
ii. enhance programming skills and biological knowledge of postgraduates to solve both biological and computational problems;
iii. produce postgraduates with IT skills and prepare them for global competitiveness and the industry;
iv. produce managers with the spirit of self-reliance and encourage them to adopt a holistic approach in their professional pursuits;
v. develop human capital with emphasis on creating a knowledge-based society.
vi. develop manpower to pursue careers in a wide range of professions including being bioinformatics researchers, laboratory facilities managers, pharmaceutical research technicians, research data technicians, and teachers/professors, among others.

Degree Nomenclature

The Department of Computer and Information Sciences offers two postgraduate degree programmes in Bioinformatics, namely:

i. Master of Science (M.Sc.) in Bioinformatics
ii. Doctor of Philosophy (Ph.D.) in Bioinformatics

7.2.3 Academic Content

7.2.3.1 Admission Requirements

A. Master of Science (M.Sc.) Bioinformatics

Admission Criteria

i. Credit level pass in five (5) subjects in the SSCE/GCE/NECO O/L or their equivalent must be obtained in not more than two sittings and must include Mathematics, English Language, Biology, Chemistry and any other relevant science subject, namely, Physics, Technology, Data Processing, Computer Science, Agricultural Science, Further Mathematics.

1. Admission is open to candidates with a good first degree (B.Sc.) in Computer Science, Chemistry, Biotechnology, Molecular Biology, Biochemistry, Biological Sciences, Statistics, Mathematics, and any related science and engineering discipline, with a minimum of Second Class Lower Division from Covenant University, or any other university recognised by the Senate of Covenant University.

ii. Candidates with a third class degree will be deemed eligible if such candidates have obtained a Postgraduate Diploma (PGD) in Computer Science, Chemistry, Biotechnology, Molecular Biology, Biochemistry, Biological Sciences, Statistics, Mathematics, and any related science and engineering discipline, from a recognised university.
iii. Candidates with at least a lower credit in Higher National Diploma (HND) and university PGD with a minimum CGPA of 3.50 may be considered for admission.
iv. In addition to the qualification requirements above, candidates shall be required to participate in a postgraduate screening exercise to qualify for admission.

B. M.Phil./Ph.D. Bioinformatics

Admission Criteria

i. Credit level pass in five (5) subjects in the SSCE/GCE/NECO O/L or their equivalent must be obtained in not more than two sittings and must include Mathematics, English Language, Biology, Chemistry and any other relevant science subject, namely, Physics, Technology, Data Processing, Computer Science, Agricultural Science, Further Mathematics.

ii. Admission is open to applicants who possess a Master of Science degree (M.Sc.) in Computer Science, Chemistry, Biotechnology, Molecular Biology, Biochemistry, Biological Sciences, Statistics, Mathematics, and any related science and engineering discipline with a CGPA of 3.5 - 3.99 from Covenant University or any other recognised university.

iii. A candidate who has demonstrated sufficient academic promise may be considered for change of registration status from M.Phil. to Ph.D. after the successful completion of two semesters in the M.Phil. programme and having presented at least three seminars (including a proposal defence), in demonstration of that competence, subject to approval by the Faculty/Board of Postgraduate Studies and Senate. Such candidate must have obtained a minimum CGPA of 4.0 after the two semesters of coursework.

iv. In addition to the above qualification requirements, candidates shall be required to participate in a postgraduate screening exercise to qualify for admission.

C. Ph.D. Bioinformatics

Admission Criteria

i. Credit level pass in five (5) subjects in the SSCE/GCE/NECO O/L or their equivalent must be obtained in not more than two sittings and must include Mathematics, English Language, Biology, Chemistry, and any other relevant science subject, namely, Physics, Technology, Data Processing, Computer Science, Agricultural Science, Further Mathematics.

ii. A candidate with an academic Master's degree (M.Sc.) in Computer Science, Chemistry, Biotechnology, Molecular Biology, Biochemistry, Biological Sciences, Statistics, Mathematics, and any related science and engineering discipline with a Cumulative Grade Point Average (CGPA) of not less than 4.0 on 5-point scale or weighted average of 60% from a recognised university shall be eligible for admission into the Ph.D. Bioinformatics programme.

iii. In addition to the qualification requirements above, candidates shall be required to participate in a postgraduate screening exercise to qualify for admission.

7.2.3.2 Areas of Specialisation

The following are the areas of Specialisation in Bioinformatics:

i) Programming
ii) Statistical genetics
iii) Genome bioinformatics
iv) Functional genomics
v) Network biology
vi) Systems biology
vii) Population genetics

7.2.3.3 Duration of Programme

i. Master of Science (M.Sc.) Bioinformatics

A full-time M.Sc. Bioinformatics degree programme shall last for a minimum of four (4) semesters, comprising two (2) semesters of coursework and two (2) semesters of research.

ii. M.Phil./Ph.D. Bioinformatics

A full-time M.Phil./Ph.D. Bioinformatics programme shall last for a minimum of eight (8) semesters, comprising two (2) semesters of coursework and six (6) semesters of research.

iii. Ph.D. Bioinformatics

A full-time Ph.D. Bioinformatics degree programme shall last for a minimum of six (6) semesters, comprising one (1) semester of coursework and five (5) semesters of research.

7.2.3.4 Graduation Requirements

i. Master of Science (M.Sc.) Bioinformatics

A candidate will be required to complete satisfactorily, a minimum of **59** prescribed course units, submit and defend orally, a dissertation of original research work on a previously approved topic for internal and external examination.

ii. M.Phil./Ph.D. Bioinformatics

A candidate will be required to complete satisfactorily, a minimum of **74** course units. A candidate, upon successful completion of prescribed courses and defence of a research proposal, may be recommended to proceed into the Ph.D. programme. To be eligible for conversion into the Ph.D. programme, the M.Phil. candidate must have passed all the stipulated courses with a minimum CGPA of 4.0 and successfully carried out the M.Phil./Ph.D. proposal defence.

iii. Ph.D. Bioinformatics

The performance of the candidate shall be a combination of performance at coursework, seminars, together with the quality of written thesis and performance at an oral examination. The thesis of original research work on a previously approved topic shall be subjected to internal and external examination in addition to a defence for its assessment. The minimum credit units for the award of a Ph.D. in Bioinformatics is 59.

Table 1: Summary of Graduation Requirements

Level	Core Courses	University Courses	Elective Courses	Ph.D. Proposal/ Post-field	Dissertation /Thesis	Total
M.Sc.	36	2	12	3	6	**59**
M.Phil./Ph.D.	33	2	6	21	12	**74**
Ph.D.	21	2	3	21	12	**59**

7.2.4 Examination Requirements

7.2.4.1 Course Work

i. Candidates from non-computer-based disciplines will be required to audit and pass some specified courses from the undergraduate level. These core computer courses include Discrete Structures, Computer Programming I and II, Computer Architecture, and Operating System and Artificial Intelligence. Meanwhile, these courses will have zero credit and not add any unit towards the programme's completion.

ii. Candidates from non-biology-based disciplines will be required to audit and pass some specified courses from the undergraduate or postgraduate diploma (PGD) level. These core biology courses include two undergraduate courses namely, Molecular Biology (BCH224) and Biotechnology

(BIO217), or one PGD course, titled, Advanced Molecular Biology and Bioinformatics (BCH713). Meanwhile, the course(s) will have zero credit and not add any unit towards the programme's completion.

iii. In addition to passing the audited courses, students are generally expected to complete a minimum of **59** prescribed course units for M.Sc., seventy four (**74)** course units for M.Phil./Ph.D. and **59** course units for direct Ph.D. A candidate must have passed all the stipulated courses with a minimum CGPA of 4.0 before proceeding to M.Phil./Ph.D. and Ph.D. proposal defence.

7.2.4.2 Thesis/Dissertation

Master's thesis/dissertation preparation starts with an M.Sc. Project Seminar after acquiring a minimum of 3.0 CGPA and above in course work. Ph.D. thesis preparation commences after obtaining a minimum CGPA of 4.0 and above in Ph.D. course work. Title of thesis should not be longer than 18 words and Ph.D. thesis should be above 50,000 words.

7.2.5 Course Structure

7.2.5.1 M.Sc. Bioinformatics Programme

Table 2 M.Sc. Bioinformatics Year 1 by semesters

	M.Sc I (Bioinformatics) (1st Year)								
	ALPHA SEMESTER				OMEGA SEMESTER				
Compulsory Courses	**Course Code**	**Course Title**	**Status**	**Units**	**Course Code**	**Course Title**	**Status**	**Units**	
	BIF811	Bioinformatics I	C	3	BIF821	Bioinformatics II	C	3	
	BIF813	Scientific Computing	C	3	BIF822	Foundations of Population genetics and GWAS	C	2	
	BIF815	Biostatistics	C	3	BIF824	High-throughput Sequencing	C	2	
	BIF817	Introduction to Biological Concepts	C	3	BIF846	Biological Database Management System	C	3	
	BIF819	Introduction to Geographic Information Systems	C	2	BCH824	Advanced Molecular Biology I	C	2	
	CSC815	ICT and Research Methodology	C	3	CSC822	Advanced Programming Languages	C	3	
	EDS811	Entrepreneurial Development Studies VIII	U	1	CSC857	M.Sc. Seminar	C	3	
	TMC811	Advanced Studies in Life Skills, Strategies and Principles I	U	1	MAT843	Introduction to Mathematical Modelling	C	3	
	CSC837	Computer Programming I	C	0	CSC847	Operating System	C	0	
	CSC838	Fundamentals of Data Structure	C	0	CSC848	Computer Programming II	C	0	
	CSC839	Artificial Intelligence	C	0	CSC849	Computer Architecture & Organisation I	C	0	
	BCH813	Advanced Molecular Biology and Bioinformatics	C	0					
	Compulsory Courses Total			**19**				**21**	**40**

Electives	***Select (6 Units) from Electives***								
	BIF831	Infectious Diseases	E	2	BIF848	Biological Basis of Non-Infectious Diseases	E	2	
	BIF853	Optimisation	E	3	CSC826	Software Testing & Quality Assurance	E	3	
	BCH819	Forensic Biochemistry	E	2	CSC827	Mobile and Adaptive Systems	E	3	
	BCH835	Introductory Cancer Biology	E	2	CSC829	Artificial Neural Networks	E	3	
	CHM812	Advanced Applied Spectroscopy	E	3	MCB822	Advanced Microbial Genetics and Biotechnology	E	3	
	CSC812	Advanced Computer Algorithms	E	3	MCB842	Medical Parasitology and Entomology	E	3	
	CSC813	Advanced Software Engineering	E	3					
	CSC817	Software Architecture and Design	E	3					
	CSC819	Machine Learning	E	3					
	MCB815	Advanced Immunology and Virology	E	3					
		Sub-Total		**6**		**Sub-Total**		**6**	
	TOTAL			**25**				**27**	**52**

Table 3 M.Sc. Bioinformatics Year 2 by semesters

M.Sc. II (Bioinformatics) (2nd Year)										
ALPHA SEMESTER					**OMEGA SEMESTER**					
Course Code	**Course Title**	**Status**	**Units**	**Pre-Requisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-Requisite**	
CSC858	Post Field	C	3		BIF859	Research/ Dissertation	C	6		
			3					**6**		**9**
	TOTAL		**3**			**TOTAL**		**6**		**9**

7.2.5.2 M.Phil./Ph.D. Bioinformatics Programme

Table 4 M.Phil./Ph.D. Bioinformatics Year 1 by Semesters

M.Phil. I (Bioinformatics) (1st Year)											
	ALPHA SEMESTER					**OMEGA SEMESTER**					
Compulsory Courses	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-Requisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-Requisite**	
	BIF913	Scientific Computing	C	3		BIF943	Computational Molecular Biology	C	3		
	BIF915	Biostatistics	C	3		BIF945	High-throughput and Virtual Screenings	C	3		
	BIF917	Introduction to Biological Concepts	C	3		BIF947	Seminar 1-Current Topics in Bioinformatics	C	3		
	BIF919	**Introduction to Geographic Information System**	C	2		CSC946	Data Mining and Warehousing	C	3		

	CSC915	ICT and Research Methodology	C	3		CSC948	Seminar 2- Technical Report Writing	C	3		
	EDS911	Entrepreneurial Development Studies VIX	U	1		CSC937	Operating System	C	0		
	TMC911	Advanced Studies in Life Skills, Strategies and Principles II	U	1		CSC938	Computer Programming II	C	0		
	CSC927	Computer Programming I	C	0		CSC939	Computer Architecture & Organisation I	C	0		
	CSC928	Fundamentals of Data Structure	C	0							
	CSC929	Artificial Intelligence	C	0							
	BCH913	Advanced Molecular Biology and Bioinformatics	C	0							
	Compulsory Courses Total			**16**					**15**		**31**
Electives	***Select (6 Units) from Electives***					***Select (6 Units) from Electives***					
	BCH933	Topics in Cancer Research	E	3		BIF933	Advanced Population genetics and GWAS	E	3		
	CHM912	**Advanced Applied Spectroscopy**	E	3		BIF935	Advanced Biological Database Management System	E	3		

	CHM916	**Selected Topics in Heterocyclic Chemistry**	E	3		BIF955	Infectious and Non-Infectious Diseases	E	3		
	CSC913	Advanced Software Engineering	E	3		BIF957	Advanced Optimization	E	3		
	CSC941	Cluster & Grid Computing	E	3		CHM925	**Selected Topics in Organic Chemistry**	E	3		
				6					6		12
	Compulsory and Electives Total			22					21		43

Table 5 M.Phil./Ph.D. Bioinformatics Year 2 by Semesters

M.Phil. II (Bioinformatics) (2nd Year)											
	ALPHA SEMESTER					**OMEGA SEMESTER**					
Compulsory Courses	**Course Code**	**Course Title**	**Status**	**Units**	**Prerequisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Prerequisite**	
	CSC949	Departmental Ph.D. Proposal Defence	C	**3**		CSC951	Field Work I	C	**3**		
	CSC950	College Ph.D. Proposal Defence	C	**3**							
				6					**3**		**9**
		TOTAL		**6**			**TOTAL**		**3**		**9**

Table 6 M.Phil./Ph.D. Bioinformatics Year 3 by Semesters

M.Phil. III (Bioinformatics) (3rd Year)											
	ALPHA SEMESTER					**OMEGA SEMESTER**					
Compulsory Courses	**Course Code**	**Course Title**	**Status**	**Units**	**Prerequisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Prerequisite**	
	CSC952	Field Work II	C	**3**		CSC953	Departmental Ph.D. Post-field Defence I	C	**3**		
				3					**3**		**6**
		TOTAL		**3**			**TOTAL**		**3**		**6**

Table 7 M.Phil./Ph.D. Bioinformatics Year 4 by Semesters

M.Phil. IV (Bioinformatics) (4th Year)											
	ALPHA SEMESTER					**OMEGA SEMESTER**					
Compulsory Courses	**Course Code**	**Course Title**	**Status**	**Units**	**Prerequisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Prerequisite**	
	CSC954	Departmental Ph.D. Post-field Defence II	C	**3**		CSC955	Supervised Thesis Research (Assessors' Report)	C	**3**		
						CSC956	Thesis Write-Up (Ph.D. Final Oral Defence) VIVA	C	**12**		
				3					**15**		**18**
		TOTAL		**3**			**TOTAL**		**15**		**18**

7.2.5.3 Ph.D. Bioinformatics Programme

Table 8 Ph.D. Bioinformatics Year 1 by Semesters

Ph.D. I Bioinformatics (1st Year)											
	ALPHA SEMESTER					**OMEGA SEMESTER**					
Compulsory Courses	**Course Code**	**Course Title**	**Status**	**Units**	**Prere-quisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Prerequisite**	
	BIF937	Basic Biological Concepts	C	3		CSC949	Departmental Ph.D. Proposal Defence	C	3		
	BIF941	Advanced Biostatistics	C	3		CSC950	College Ph.D. Proposal Defence	C	3		
	BIF943 (former CSC943)	Computational Molecular Biology	C	3		CSC977	Operating System	C	0		
	BIF945	High-throughput and Virtual Screenings	C	3		CSC978	Computer Programming II	C	0		
	BIF947	Seminar 1- Current Topics in Bioinformatics	C	3		CSC979	Computer Architecture & Organisation I	C	0		
	CSC945	ICT and Research Methodology	C	3							
	CSC946	Data Mining and Warehousing	C	3							
	CSC948	Seminar 2- Technical Report Writing	C	3							
	EDS911	Entrepreneurial Development Studies VIX	U	1							
	TMC911	Advanced Studies in Life Skills, Strategies and Principles II	U	1							
	CSC967	Computer Programming I	C	0							
	CSC968	Fundamentals of Data Structure	C	0							
	CSC969	Artificial Intelligence	C	0							

	BCH953	Advanced Molecular Biology and Bioinformatics	C	0								
	Total			**26**						**6**		**32**
Electives	***Electives Option (Add 3 Units)***											
	BIF933	Advanced Population Genetics and GWAS	E	3								
	BIF935	Advanced Biological Database Management System	E	3								
	BIF955	Infectious and Non-Infectious Diseases	E	3								
	BIF957	Advanced Optimisation	E	3								
	BIF959	**Geographic Information System and Remote Sensing**	E	2								
	BCH933	Topics in Cancer Research	E	3								
	CHM912	**Advanced Applied Spectroscopy**	E	3								
	CHM916	**Selected Topics in Heterocyclic Chemistry**	E	3								
	CHM931	**Methods for Environmental and Industrial Analysis**	E	3								
	CSC941	Cluster & Grid Computing	E	3								
				3								**3**
	TOTAL			**29**						**6**		**35**

Table 9 Ph.D. Bioinformatics Year 2 by Semesters

Ph.D. II Bioinformatics (2nd Year)											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory	Course Code	Course Title	Status	Units	Prerequisite	Course Code	Course Title	Status	Units	Prerequisite	
	CSC951	Field Work I	C	**3**		CSC952	Field Work II	C	**3**		
				3					**3**		**6**
		TOTAL		**3**			**TOTAL**		**3**		**6**

Table 10 Ph.D. Bioinformatics Year 3 by Semesters

Ph.D. III Bioinformatics (3rd Year)											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory Courses	Course Code	Course Title	Status	Units	Prerequisite	Course Code	Course Title	Status	Units	Prerequisite	
	CSC953	Departmental Ph.D. Post-field Defence I	C	**3**		CSC955	Supervised Thesis Research (Assessors' report)	C	**3**		
	CSC954	Departmental Ph.D. Post-field Defence II	C	**3**		CSC956	Thesis Write-Up (Ph.D. Final Oral Defence) VIVA	C	**12**		
				6					**15**		**21**
		TOTAL		**6**			**TOTAL**		**15**		**21**

7.2.6 Course Description (M.Sc. & M.Phil./Ph.D. and Ph.D.)

a. M.Sc. I - ALPHA SEMESTER COURSES

EDS811: Entrepreneurial Development Studies VIII (1 unit)
This course covers the following topics: Introduction, Historical Background, Definition of Entrepreneurship/Entrepreneur, Theories, Types and Characteristics; Idea Generation, Opportunity Scouting and Exploitation; Environment of Entrepreneurship/Factors that Influence Successful Entrepreneurship; Entrepreneurs and Health Issues; The Concept of Intrapreneurship and Human Capital; Capital Knowledge, ICT, and Entrepreneurship; Creativity, Innovation and Sustainable Entrepreneurship; Wealth Creation and Waste Recycling Process; Marketing and Entrepreneurial Marketing; Financing SMEs in Nigeria— A Review of Formal and Informal Financing; Characteristics, Policy/Theoretical Framework and Challenges of Women Entrepreneurship; Social Evidence of Entrepreneurship and Ethics; Academic Entrepreneurship, Intellectual Property and R&D; and Feasibility Report and Business Plan.

TMC811: Advanced Studies in Life Skills, Strategies and Principles I (1 unit)
The topics in this course include: Introduction; Man as a Tripartite Being (Body, Soul and Spirit); Self-Discovery and the Making of a Total Man; Integrity and Character Development; Biographical Studies; Introduction to Leadership Development; Christian Work Ethics; Vision Building; and Leadership Virtues and Dispositions.

BIF811 (formerly CSC831): Bioinformatics I (3 Units)
In this course, students are introduced to the basic concepts of molecular biology, importance of bioinformatics, pair-wise sequence alignment (dynamic programming, heuristic methods and similarity matrices), multiple sequence alignment, BLAST, FASTA, Hidden Markov Model (HMM) (construction, application in alignment, and gene prediction), phylogenetic tree, fragment assembly, physical mapping, combinatoric application in sequencing, sequence analysis and annotating, genomic rearrangements, and computational gene finding.

BIF813: Scientific Computing (3 Units)
The scope of this course covers an introduction to Linux operating system; kernel, system library and utilities. The course content also includes the theory of computation: computability and complexity. Other aspects of the course include: Fundamental data structures and applications in genomics and proteomics— Abstract data types and data structures; entity-relationship data modelling (arrays, strings, and trees), and graph algorithms; basic computational geometry algorithms. In addition to these, students are exposed to the background of scientific computing with Python; Python programming: basics, variables, type conversion, I/O and import, operators, namespace, flow control, functions; multidimensional data arrays; scientific algorithms for Python: special functions, integration, 2D and 3D plotting, etc.; and current trends in bioinformatics.

BIF815: Biostatistics (3 units)
This course covers the following: introduction to biostatistics with applications, probability and statistics; types and presentation of data; overview of measures of central tendency; population and sample size; sampling distribution; research design; probability distributions (discrete and continuous): normal, binomial, geometric, and Poisson distributions, and their applications in biology/medicine; tests of hypothesis: chi-square test and students t test; analysis of variance (ANOVA); and correlation and regression. Other aspects of this course are: an overview of non-parametric tests; statistical packages in R software; Markov Chain Monte Carlo; introduction to Bayesian statistics and maximum likelihood; and analysis of molecular variance.

BIF817: Introduction to Biological Concepts (3 Units)
This course provides an overview of the components and organisation of the genetic material in all domains of life (viruses, bacteria, archaea, eukaryotes), cells, biological molecules (DNA, RNA, protein) and central dogma, genes and genomes. It also introduces students to basic molecular genetics; gene expression; and regulation analyses in various organisms.

BIF819: Introduction to Geographic Information System (2 Units)
Aspects of this course include: the origin and applications of Geographic Information System (GIS); GIS data models: vector and raster; an overview of coordinate reference systems; field or geographical data collection procedures, e.g. using GPS and smartphones; and introduction to GIS software for data visualisation, such as ArcGIS, QGIS. The scope of this course also covers computer cartography and map design.

CSC815: ICT and Research Methodology (3 Units)
This course provides students with an overview of research methodologies and sampling techniques. It also comprises an introduction to informatics research; an overview of empirical research methods; and technical writing– conducting literature reviews, problem formulation and synthesis, ethics of ICT research.

BIF831: Infectious Diseases (2 Units)
The contents of this course include the following: an overview of infectious diseases and identification of disease agents, with examples from bacteria, parasites, fungi, and viruses. The course also covers epidemics, endemics, pandemics, and outbreaks; the biology of emerging and re-emerging infectious disease agents (modes of transmission, structure, reproduction mechanisms, disease symptoms), e.g. Ebola virus, Zika virus. Metagenomics is another aspect which this course includes.

BIF853: Optimisation (3 Units)
The scope of this course includes: the basis of applied optimisation; an overview of basic optimisation techniques; linear and integer programming and their applications in population dynamics, ecology, genetics and biological systems; the critical path method; simplex methods and graphical solutions; an overview of the software for solution; inventory control and queuing. The course further covers: non-linear optimization techniques; modelling: branch and cut, and Lagrangian relaxation techniques; together with current trends in software for solving optimisation problems.

BCH819: Forensic Biochemistry (2 Units)
The topics in this course, among others, are: Organisation and Services of the Crime Laboratory; Processing the Crime Scene; Legal Issues at the Crime Scene/Good Lab Techniques and Safety; Types of Physical Evidence; Significance of Physical Evidence; Morphology of Hair; Identification and Comparison of Hair; Types of Fibres; Comparison and Preservation of Fibre Evidence; Forensic Examination of Paint; History of Fingerprints; Classification of Fingerprints; Methods of Detecting Fingerprints; Preservation of Developed Prints; The Nature of Blood; Forensic Characteristics of Bloodstains; Stain Patterns of Blood; Principles of Heredity; DNA; DNA Typing; Gel Electrophoresis; The Combined DNA Index System (CODIS); The Collection and Preservation of Biological Evidence for DNA Analysis; Drug Identification; Collection and Preservation of Drug Evidence; and Chemical Analysis of Drugs Using Spectroscopy.

BCH835: Introductory Cancer Biology (2 units)
The scope of this course includes: basic cell structure, function, and dynamics; cell cycle; cell division, apoptosis, compartmentalisation, transport, motility, interaction, adhesion, regulation, heterogeneity, differentiation, and senescence; angiogenesis; general concept of carcinogenesis (chemical, viral, and

physical), metastasis and invasion; tumour immunology (tumour antigens and immunosurveillance); and stem cell biology and therapeutic approaches.

CHM812 - Advanced Applied Spectroscopy (3 Units)
The core aspects of this course are as follows: basic instrumentation and techniques; applications of UV, IR, NMR, and MS in chemical analysis and structural elucidation; high resolution NMR and 13C-NMR and other nuclei; shift reagents; all ion structures and fragmentation; field desorption; fast atomic bombardment; and recent applications of linked scan mass spectrometer.

CSC812: Advanced Computer Algorithms (3 units)
The course content includes: A review of data structures; linear data structures, hashing, tress, graphs, and recursion; complexity classes; empirical measurements of performance; time and space trade-offs analysis; algorithmic strategies: brute-force algorithms; greedy algorithms; divide-and-conquer; backtracking, branch-and-bound; minimum spanning tree and heuristics; pattern matching and string/text algorithm; numerical approximation algorithms; together with tractable and intractable problems.

CSC813: Advanced Software Engineering (3 Units)
This course explains software engineering and its place as an engineering discipline. It also includes the following topics: Life cycle of software system— requirements analysis, development, operation and maintenance; software metrics— portability, re-usability, correctness, reliability, efficiency, usability, integrity, maintainability and flexibility; software quality and testing; software architecture— architecture description languages, pattern-oriented software architecture, component-based development, distributed software architecture using middleware, enterprise application integration, architecture for mobile and pervasive systems and model-driven architecture. Other aspects of this course are: advanced modelling— UML extension mechanisms, object constraint language, and model checking; software project management— the study of interpersonal process decision making styles; problem-solving concepts and procedures, creative effort, conflict resolution, leadership and assessment. The course further includes: concepts of motivation, team work, and group dynamics; software engineering and law— intellectual property law, professional ethics, and code of conduct; patents, trademarks, copyright, trade secrets, privacy and confidentiality, contracts and licensing, government regulations, global legal issues including Internet law and cybercrime. In addition, the course provides an overview of open source software.

CSC817: Software Architecture and Design (3 Units)
The scope of this course covers: the software architecture process— describing, evaluating, and designing systems at the architectural level; the role of architecture and the architect in the software development cycle; architectural patterns and tactics, architecture assessment techniques, architecture driven design, and techniques for documenting architectures; design patterns, architectural design issues– reliability, performance, availability, scalability, architecture evaluation methods; case studies of real-world software architectures; advanced architecture topics— self-adaptation, service-oriented architectures, software-product lines, and product line architectures, domain-specific architectures, and agent-based architectures. Students also learn the identification of open problems in software architecture.
The course will introduce architectural patterns and tactics, architecture assessment techniques, architecture-driven design, and techniques for documenting architectures. The course will also involve design, development, and assessment activities.

CSC819: Machine Learning (3 Units)
The focus of this course includes: introduction to soft computing methods– fuzzy logic and fuzzy systems, rough sets; evolutionary algorithms– genetic algorithms, particle swarm intelligence, ant colony algorithms; artificial neural networks, Bayesian networks, support vector machines; and application of soft computing to data mining.

MCB815: Advanced Immunology and Virology (3 Units)
This course covers topics such as: basic virology, virological methods, virus/antigen detection, propagation of viruses, viral– host cell interaction, and viral replication. Others include: antivirals and vaccines; tissue culture techniques and vector biology; advanced integrated presentation of animal, bacterial, and plant viruses; structure and mode of regulation and replication effect on host cells, and modern viral infections.

CSC837: Computer Programming I (0 Unit)
This course introduces problem solving methods and algorithm development. Its scope covers designing, coding, debugging, and documenting programmes using techniques of a good programming language style. Students are taught programming language and programming algorithm development with a widely used programming language such as C/C++.

CSC838: Fundamentals of Data Structure (0 Unit)
For this course, students are exposed to primitive types, arrays, records, strings and string processing. They also learn data representation in memory, stack and heap allocation, queues, and trees. In addition to these, they learn implementation strategies for stack, queues, and trees; run-time storage management; pointers and references; and linked structure.

CSC839: Artificial Intelligence (0 Unit)
This course covers the following: an introduction to artificial intelligence; understanding natural languages; knowledge representation; expert systems; pattern recognition; and the language, LISP.

BCH813: Advanced Molecular Biology and Bioinformatics (3 Units)
Aspects of this course include: organisation of gene structure in prokaryotes and eukaryotes; gene expression— DNA replication, transcription, translation and genetic code; bacteriophages and eukaryotic viruses (structure, life cycles, biological assays etc.); mutation and mutagenesis; DNA repair mechanisms; genes and cancer; recombination; plasmids and transposoons; restriction enzymes; techniques in molecular biology— PCR, microarray, etc.; basic concepts of biotechnology; history and evolution of biotechnology; the inter-disciplinary nature of biotechnology; introduction to the principles and techniques in biotechnology; applications of biotechnology in medicine, food/agriculture, industries, and environment; together with genetic modification. Other aspects of the course include: introduction to bioinformatics— historical perspectives, definitions, and impact of genomics on problems in molecular and cellular biology; sequence driven and data driven problems; databases; algorithms for the acquisition and analysis of information from DNA— sequence similarity, sequence alignment and multiple sequence alignment, string alignment and algorithms; genome organisation; structure and function of the genome, with emphasis on gene mapping and sequencing projects**;** genomic analysis; and proteomics.

a. M.Sc. I - OMEGA SEMESTER COURSES

BIF821 (formerly CSC841): Bioinformatics II (3 Units)
The contents of this course include: RNA secondary structure prediction; protein homology modelling; protein threatening; protein molecular dynamics; protein as initial structure prediction; integration of molecular biology data banks; and experimentation biology support (sequence, structure prediction, DNA arrays, etc.).

BIF822: Foundations of Population Genetics and GWAS (2 Units)
This course covers the following: fundamentals of population genetics— allele frequency, genotype frequency, Hardy-Weinberg Equilibrium, linkage disequilibrium, natural selection, genetic drift, mutation, gene flow; demography and population structure; haplotype phasing, SNP tagging and genotyping quantitative trait loci (QTL) mapping. The course also covers Genome Wide Association Studies (GWAS), with focus on GWAS data, disease models, and GWAS applications.

BIF824: High-Throughput Sequencing (2 Units)
In this course, students learn the basic background of sequencing technologies; applications of high throughput sequencing; and whole exome sequencing versus whole genome sequencing. They are also introduced to file formats and quality checks. In addition, students learn sequencing mapping and assembly, ChIP-seq, re-sequencing and variant analyses. They also learn design and deployment of high-performance computational infrastructures for the analyses of next generation sequencing (NGS) data, metagenomics. Furthermore, students have an overview of cyberenvironments for the processing and analyses of NGS data: web-based environment, cloud computing, and genome browsers.

BIF846: Biological Database Management Systems (3 Units)
This course covers the following: biological data types and importance of metadata; an overview of database concepts— file systems and database; components of biological databases— classification, e.g. types of public databases; bioinformatics databases and biological database structures, e.g. UniProt, GO, KEGG and major databases for research within bioinformatics; database management system (DBMS)— components and data abstractions; database schemas using the relational database model; database query; design concepts and implementation— entity relationship (E-R) modelling; normalisation of database tables and structured query language; database design and implementation; designing of conceptual data models; logical versus physical database design; transaction management and concurrency control; introduction to distributed database management systems; database privacy, security, failure, and recovery; software— SQL; and applications of database technology.

BCH824: Advanced Molecular Biology I (2 Units)
The core components of this course are: A review of the pathway of gene expression; polynucleotide hybridisation and application; gene mapping and gene organisation; control of gene expression and differentiation; in-vivo gene transaction and rearrangement; techniques of in-vivo gene manipulation; peptide synthesis core, genetic variation and evolution; the human genome; expression profiling; proteome families; structural proteomics; gene finding/gene structure; protein function and annotation; and nanotechnology.

CSC822: Advanced Programming Languages (3 Units)
This course involves a comparative study of the organisation and implementation of a variety of programming languages and language features. Also, design principles are explored and applied in a historical review of major languages. Furthermore, students learn procedural, functional, logic-based, object-oriented and parallel languages. In addition, research issues such as polymorphism, formal semantics and verification explored in-depth.

CSC857: M.Sc. Seminar (3 Units)
Students will participate in departmental seminars and join relevant research clusters. Students are expected to present two seminars as part of the graduation requirements.

MAT843 - Introduction to Mathematical Modelling (3 Units)
This course expatiates on mathematical modelling as the art of transforming real life situations, as in biology, business, deformable media, industry, and other dynamical systems into mathematical form. Case studies are examined in the course.

BIF848: Biological Basis of Non-Infectious Diseases (2 Units)
This course provides an overview of the pathophysiology of diseases, prevention and general disease treatment principles and the prevalence of non-infectious diseases. Examples of such diseases include: cardiovascular diseases, diabetes, and mental health disorders, and their prevalence. The scope of this course also covers cytogenetics and genomic identification of congenital anomalies with examples, and environmental contributions to diseases.

CSC826: Software Testing and Quality Assurance (3 Units)
This course comprises the following: test life cycle planning; test design and coverage analysis; complexity; levels of testing— unit, integration, system, performance, and stress testing; best practice strategies in software testing, such as verification and validation, early life cycle testing, risk-based testing and automation, test automation methods and tools; software quality; and software metrics.

CSC827: Mobile and Adaptive Systems (3 Units)
This course begins with an introduction and an overview. It further covers the following: 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; examples of technologies at the physical/link layers— PANA BLUETOOTH, LANs IEEE802.11, HiperLAN, basic GSM and GPRS network structures and protocol architectures, next generation wireless overview including UMTS, IMT-200 and W-CDMA; mobile IP— mobile IPv4 and mobile IPv6, problems with routing, quality of service and security. The course further includes an overview of the use of intelligence in mobile systems and power management issues; file systems: CODA, and the likes, and mobile infrastructure support; 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; programming networking; and applications for mobile systems– Android programming, i-Pad programming, code mobility and control/signalling.

CSC829: Artificial Neural Networks (3 Units)
Students are to expect the following in this course: Definition of artificial neural networks; similarities between neural networks and the human brain; classification of ANN; terms used in ANN: input/output sets, weights, bias or threshold, supervised learning, network training, convergence process, single layer vs. multilayer perception, forward and backward propagation, gradient descent rule. The course also covers the following: back-propagation neural network; variable terms used in back propagation neural networks: learning rate, momentum, hidden nodes, sigmoid activation function; back propagation algorithm of ANN; design of ANN model; training sets for ANN; test sets for ANN; network testing and performance; applications of ANN; programming of ANN; other ANN models – radial basis networks, functional link networks, Helman networks, Adaline, Mandaline, unsupervised learning networks, recurrent networks, Hopfield networks, Boltzmann machine, self-organising maps (SOM), hybrid neural network configurations; and learning in ANN – supervised, unsupervised, reinforcement learning, and Hebbian learning.

MCB822: Advanced Microbial Genetics and Biotechnology (3 Units)
The course contents are as follows: introduction to microbial biotechnology: recombinant protein production, vaccine production; scope of fermentation biotechnology; large-scale microbial fermentation: principles and problems. introduction, role and function of microbial enzymes; mechanisms and kinetics of enzyme reaction; regulatory enzymes and the control of enzyme pathways; feedback inhibition; allosteric enzymes; application of enzymes; growth and development of microorganisms in bioreactors, biosensors and strain development; and recombinant protein production.

MCB842: Medical Parasitology and Entomology (3 Units)
The scope of this course includes: medical protozoology, medical helminthology, medical entomology, control of parasitic infections, immunology of parasitic infections, and laboratory methods in parasitology.

CSC847 Operating System I (0 Unit)
Topics covered include: An Overview of O/S: Role & Purpose; Functionality Mechanisms to Support Client-Server Models; Hand-Held Devices; Design Issues; Influences of Security; Networking; Multimedia; Windows; O/S Principles: Structuring Methods Abstraction, Processes and Recourses; and The Concept of APIS Device Organisation Interrupts.

CSC848: Computer Programming II (0 Unit)
Aspects of this course include: principles of good programming; structured programming concepts; debugging and testing; string processing; internal searching and sorting; and recursion. Students also learn to use a programming language that is different from that learnt in CSC 201, e.g. C# or VB.net.

CSC849: Computer Architecture and Organisation I (0 Unit)
The course contents include: fundamental building blocks; logic expressive immunisation; sum of product forms; register transfer notation; physical considerations; data representation and number bases; fixed and floating point systems; and representation memory systems organisation and architecture.

M.Sc. II - OMEGA SEMESTER COURSES

BIF859: Research / Dissertation II (6 Units)
Students apply different bioinformatics techniques and tools to research-oriented real-life problems. The students should choose an area from the listed areas of Specialisation in bioinformatics. The students will undertake research under the supervision of their supervisors towards the preparation of a Master's dissertation.

c. M.PHIL./Ph.D. - ALPHA SEMESTER COURSES

EDS911: ENTREPRENEURIAL DEVELOPMENT STUDIES VIX (1 Unit)
The topics in this course are: Venture Starter Guide; Venture Creation; Innovate or Die; The Start-Up Way; Biblical Business Principles; The Business of Your Talents and Skills; Entrepreneurial Leadership; Product Development; Deal-Making and Negotiation; Marketing and Selling; After 5pm: When True Work Actually Begins; and The Gig Economy.

TMC911: Advanced Studies in Life Skills, Strategies and Principles II (1 Unit)
The topics in this course are: Introduction; Man as a Tripartite Being (Body, Soul and Spirit); The Place of Preparation; Self-Discovery and the Making of a Total Man; Biographical Studies; Self-Management Strategies; Models of Leadership; Multiple Intelligence; and Spirituality and Academic Excellence.

BIF913: Scientific Computing (3 Units)
Aspects covered in this course are: introduction to Linux operating system: kernel, system library and utilities; theory of computation: computability and complexity; fundamental data structures and applications in genomics and proteomics— abstract data types and data structures; entity-relationship data modelling (arrays, strings and trees) and graph algorithms; basic computational geometry algorithms; background of scientific computing with Python; Python programming: basics, variables, type conversion, I/O and import, operators, namespace, flow control, functions; multidimensional data arrays; scientific algorithms for Python: special functions, integration, 2D and 3D plotting, etc; and current trends in bioinformatics.

BIF915: Biostatistics (3 units)
The following are the scope of this course: introduction to biostatistics with applications, probability and statistics; types and presentation of data; overview of measures of central tendency; population and sample size; sampling distribution; research design; probability distributions (discrete and continuous): normal, binomial, geometric and Poisson distributions, and their applications in biology/medicine; tests of hypothesis: Chi-square test and students t test; analysis of variance (ANOVA); correlation and regression; overview of non-parametric tests; statistical packages in R software; Markov Chain Monte Carlo; introduction to Bayesian statistics and maximum likelihood; and analysis of molecular variance.

BIF917: Introduction to Biological Concepts (3 Units)
The course contents are: overview of the components and organisation of the genetic material in all domains of life (viruses, bacteria, archaea, eukaryotes), cells, biological molecules (DNA, RNA, protein) and central dogma, genes and genomes; basic molecular genetics; gene expression and regulation analyses in various organisms.

BIF919: Introduction to Geographic Information System (2 Units)
The scope includes: the origin and applications of Geographic Information System (GIS); GIS data models: vector and raster; an overview of coordinate reference systems; field or geographical data collection procedures, e.g. using GPS and smartphones; introduction to GIS software for data visualisation such as ArcGIS, QGIS; computer cartography and Map design.

CSC915: ICT and Research Methodology (3 Units)
This course comprises the following: an overview of research methodologies; sampling techniques; introduction to informatics research; an overview of empirical research methods; technical writing– conducting literature reviews; problem formulation and synthesis; and ethics of ICT research.

BCH933: Topics in Cancer Research (3 units)
This course covers the following: cellular molecular and clinical aspects of cancer; pathological basis of cancer; molecular cancer epidemiology, prevention, and control (basic science research and applied behavioural, social, and population sciences to reduce cancer risk, incidence, morbidity and mortality, and improve quality of life); health disparities in cancer (biological/genetic/genomic/epigenetic basis for observed cancer susceptibility/response to therapy and unequal burdens of cancer across racial/ethnic populations); clinical survey of common human cancers (natural history, biology, and treatment); principles and practices of behavioural science in cancer control (application of social, psychological, behavioural, and translational research from cancer diagnosis to survivorship); epigenetic mechanisms and environmental impact; translational bioinformatics and approaches in cancer biology; infectious diseases/inflammation and cancer; cancer biomarkers and therapeutics.

CHM912 - Advanced Applied Spectroscopy (3 Units)
This course surveys recent advances in applied atomic and molecular spectroscopy. This will involve a comprehensive literature search, treatment of theories, and applications of such new spectroscopic techniques.

CHM916 - Selected Topics in Heterocyclic Chemistry (3 Units)
Students work on selected subjects from current literature and specialised topics currently of research interest to available postgraduate staff.

CSC913: Advanced Software Engineering (3 Units)
The scope of this course is as follows: software engineering and its place as an engineering discipline; life cycle of software systems— requirements analysis, development, operation and maintenance; software metrics— portability, re-usability, correctness, reliability, efficiency, usability, integrity, maintainability and flexibility; software quality and testing; software architecture— architecture description languages, pattern-oriented software architecture, component-based development, distributed software architecture using middleware, enterprise application integration, architecture for mobile and pervasive systems and model driven architecture; advanced modelling— UML extension mechanisms, object constraint language and model checking; and software project management— study of interpersonal process decision making styles, problem solving concepts and procedure, creative effort, conflict resolution, leadership and assessment. The course also deals with the concepts of motivation, team work and group dynamics; software engineering and law— intellectual property law, professional ethics and code of conduct, patents, trademarks, copyright, trade secrets, privacy and confidentiality, contracts and licensing, government regulations, global legal issues including Internet law and cyber-crime. In addition to these, the course provides an overview of Open Source Software.

CSC941: Cluster and Grid Computing (3 Units)
The purpose of the course is to provide basic knowledge on the most important principles, methods, tools, systems, standards, etc. of cluster and grid technologies. The course is aimed at bridging the gap in university education between the distributed and high performance topics in the fields of computer science and engineering. It also focuses on the current hot research topics and activities of the fields.
The course outline is as follows:
Introduction to Distributed and High-Performance Computing; Basic Terms: Distributed Computing, HPC, HPCC, Network Computing, Internet Computing, Cluster, Grid, Meta-Computing, Middleware, etc.; Milestones of the History, Some Representative Applications; Classification: Taxonomies, MPP, SMP, CC-NUMA, Cluster: Dedicated High Performance (HP), High Availability (HA), CoPs, PoPs, CoWs; Distributed, On-Demand, High-Throughput, Collaborative, Data-Intensive Computing; Basics of Communication Media and Protocols: TCP/IP, Internet2, Quality of Service (QoS), ATM, Fast Ethernet, etc.; Programming Models: Message Passing, Client-Server, Peer-To-Peer, Broker Computing, Code Shipping, Proxy Computing, Mobile Agents; Toolkit and Object-Oriented (OO) Systems; Higher Level Communication: Light-Weight Communication, Sockets, Standard APIs, Active Messages; Storage and File Problems: Network Ram, Raid and Software Raid; Distributed File Systems: Network File System (NFS), AFS, OSF-DSF, RSF; Message Passing Standards: PVM (Parallel Virtual Machine), MPI (Message Passing Interface); Object-Oriented De Facto Standards CORBA and DCOM; Java-Based Methods: JVM, Remote Method Invocation (RMI), Bytecode, Applet and Servlet, Javabean and Javaspaces, Jini; Grid Toolkit Approach: Globus Hourglass Concept, Communication, Resource and Process Management, Data Access, Security; Object-Oriented Approach: Legion Language Support, Component Wrapping, Programme Support, Resource Management; Security: Confidentiality, Integrity and Availability; Authentication, Authorisation, Assurance, Auditing, Accounting; Scheduling: Algorithms, Policies and Techniques, High Performance and High Throughput Schedulers, Resource Scheduling; and Grid Monitoring: Tasks, Types, Architecture, Components.

Other things to note: The course requires each student to make presentation on a topic that they select. Students are provided a reading list and copies of slides presented at the lectures in PDF or .ps format.

CSC927: Computer Programming I (0 Unit)
The course offers an introduction to problem-solving methods and algorithm development, designing, coding, debugging and documenting programmes using techniques of a good programming language style, programming language and programming algorithm development. A widely used programming language will be used in teaching the above, e.g. C/C++ language.

CSC928: Fundamentals of Data Structure (0 Unit)
Topics in this course include: Primitive Types, Arrays, Records, Strings and String Processing; Data Representation in Memory; Stack and Heap Allocation; Queues; TREES; Implementation Strategies for Stack, Queues, Trees; Run Time Storage Management; Pointers and References; and Linked Structure.

CSC929: Artificial Intelligence (0 Unit)
This course provides an introduction to artificial intelligence, facilitates students' understanding of natural languages, knowledge representation, expert systems, pattern recognition, the language LISP.

BCH913: Advanced Molecular Biology and Bioinformatics (0 Unit)
Aspects of this course include: organisation of gene structure in prokaryotes and eukaryotes; gene expression— DNA replication, transcription, translation and genetic code; bacteriophages and eukaryotic viruses (structure, life cycles, biological assays etc.); mutation and mutagenesis; DNA repair mechanisms; genes and cancer; recombination; plasmids and transposoons; restriction enzymes; techniques in molecular biology— PCR, microarray, etc; basic concepts of biotechnology; history and evolution of biotechnology; the inter-disciplinary nature of biotechnology; introduction to the principles and techniques in biotechnology; applications of biotechnology in medicine, food/agriculture, industries, and environment; and genetic modification.
Other aspects of the course include: introduction to bioinformatics— historical perspectives, definitions, and impact of genomics on problems in molecular and cellular biology; sequence driven and data driven problems; databases; algorithms for the acquisition and analysis of information from DNA— sequence similarity, sequence alignment and multiple sequence alignment, string alignment and algorithms; genome organisation; structure and function of the genome, with emphasis on gene mapping and sequencing projects**;** genomic analysis; and proteomics.

b. M.Phil./Ph.D. I - OMEGA SEMESTER COURSES

BIF943 (formerly CSC943): Computational Molecular Biology (3 Units)
The contents of this course are as follows: basic concepts of molecular biology; importance of bioinformatics; pair-wise sequence alignment (dynamic programming, heuristic methods and similarity matrices); multiple sequence alignment; BLAST; FASTA; Hidden Markov Model (Construction, application in alignment and gene prediction); phylogenetic tree; fragment assembly; physical mapping; combinatoric application in sequencing; sequence analysis and annotating; genomic rearrangements; and computational gene finding. The course also covers RNA secondary structure prediction; protein homology modelling; protein threatening; protein molecular dynamic; protein as initial structure prediction; integration of molecular biology data banks; and experimentation biology support (sequence, structure prediction, DNA arrays), and others.

BIF945: High-Throughput and Virtual Screenings (3 Units)
In this course, students learn sequencing technologies; *de novo* assembly and principles of genome assembly; applications of high throughput sequencing: *de novo* assembly, DNA-seq, RNA-seq, ChIP-seq and variant calling. The course also covers file formats and quality checks; sequence mapping: mapping problems caused by repeats, duplications, spliced alignment, re-calibration; sequence assembly: quality assessment; basic graph theory; design and deployment of high performance computational infrastructures for the analyses of next generation sequencing (NGS) data; metagenomics; cyber-environments for the processing and analyses of NGS data: web-based environment (Galaxy, KBase and commercial systems); cloud computing; genome browsers: canned workflows and workflow managers; integrating infrastructures for sequencing and analyses.

BIF947: Seminar 1 - Current Topics in Bioinformatics (3 Units)
The course provides a review of current work and theories in bioinformatics. Emphasis is placed on latest work and theories in bioinformatics, computational biology, etc. Each student is expected to present a seminar on any chosen topic.

CSC946: Data Mining and Warehousing (3 Units)
This course covers data warehouse and OLAP technology for data mining; data mining primitives; languages and system architecture; concept description; mining association rules in large database classification and prediction problems; cluster analysis; mining complex types of data; applications and trends in data mining; data mining algorithms: apriori, hybrid apriori, COFI-tree, FP-tree, P-tree, inverted matrix; introduction to mining relation; text; sequence; time-series; web and multimedia data.

CSC948: Seminar 2 - Technical Report Writing (3 Units)
Each student is expected to submit a bound hard copy of the contents of the seminar that was presented in BIF947.

BIF933: Advanced Population Genetics and GWAS (3 Units)
This course involves an overview of the basic concepts of population genetics: allele and genotype frequencies; linkage disequilibrium; Hardy-Weinberg equilibrium; identity by descent (IBD); pedigrees and trios; selection; drift; mutation; and gene flow. The scope of the course also covers models for population admixture: principal component analyses; clustering analyses; and ancestry inference. Other aspects of the course are: haplotype phasing by IBD; SNP tagging; coalescence and statistics; statistical analyses of quantitative genetics: QTL mapping; microarray data analyses; SNP-genotyping; genome wide association studies: disease models, GWAS in case-control design, transmission disequilibrium test, population substructure, and missing heretability problem. The course content further includes GWAS data interpretation; GWAS vs. next generation sequencing; case studies of combined statistical genetics and systems biology.

BIF935: Advanced Biological Database Management Systems (3 Units)
The course includes the following: an introduction to biological data types, importance of metadata, and database concepts: file systems and database; an overview of biological database classification and structures, and bioinformatics databases with examples; enhanced E-R model; distributed database management systems (DDMS); database privacy, security, failure and recovery; object-oriented databases; client/server systems; web database development and database administration; indexing and performance issues in biological databases; SQL or MySQL as relational database language; database administration; current trends in biological database management systems.

BIF955: Infectious and Non-Infectious Diseases (3 Units)
Students should expect the following in this course: distinction between infectious and non-infectious diseases; contributions of genetic, physiological, environmental and behavioural factors to these diseases (with examples); tropical and neglected tropical diseases; infectious diseases: biology, agents, zoonotic diseases, epidemics, endemics, pandemics, outbreaks, and genetic identification; metagenomics. Students should also expect the course to cover non-infectious diseases: key facts and risk factors, prevention and control and their prevalence. Such diseases include: cardiovascular diseases; diabetes; chronic respiratory diseases; and mental health disorders. This course further includes cytogenetics and genomic identification of congenital anomalies.

BIF957: Advanced Optimisation (3 Units)
The scope of this course is as follows: an overview of basic optimisation techniques and applied optimisation; linear programme; basic transformations; flux balance analysis (FBA): students learn to reconstruct metabolic networks, formulate dynamic mass balance, steady state mass balance, add known constraints, they also learn optimisation. The course further includes flux variability analysis (FVA); consistency checking in metabolic networks: network consistency, trivial and MBA algorithms; absolute value case; linear, integer and mixed integer programming and their applications in genetics and biological systems; use of Gurobi software; indicator and semi-continuous variables; strength of a model; products of binary and real variables; disjunctions and replacing integers with binaries; non-linear optimisation techniques; modelling: branch and cut, and Lagrangian relaxation techniques. Finally, the course explores current trends in optimisation.

CHM925 - Selected Topics in Organic Chemistry (3 Units)
Students conduct research on selected subjects from the current literature and specialised topics currently of research interest to available postgraduate staff.

CSC937 Operating System I (0 unit)
Topics covered include: An Overview of O/S: Role & Purpose; Functionality Mechanisms to Support Client-Server Models; Hand-Held Devices; Design Issues; Influences of Security; Networking; Multimedia; Windows; O/S Principles: Structuring Methods Abstraction, Processes and Recourses; and The Concept of APIS Device Organisation Interrupts.

CSC938: Computer Programming II (0 Unit)
Aspects of this course include: principles of good programming; structured programming concepts; debugging and testing; string processing; internal searching and sorting; and recursion. Students also learn to use a programming language that is different from that learnt in CSC 201, e.g. C# or VB.net.

CSC939: Computer Architecture and Organisation I (0 Unit)
The course contents include: fundamental building blocks; logic expressive immunisation; sum of product forms; register transfer notation; physical considerations; data representation and number bases; fixed and floating point systems; and representation memory systems organisation and architecture.

Ph.D. I – Alpha Semester Courses

EDS911: ENTREPRENEURIAL DEVELOPMENT STUDIES VIX (1 Unit)
The topics in this course are: Venture Starter Guide; Venture Creation; Innovate or Die; The Start-Up Way; Biblical Business Principles; The Business of Your Talents and Skills; Entrepreneurial Leadership; Product Development; Deal-Making and Negotiation; Marketing and Selling; After 5pm: When True Work Actually Begins; and The Gig Economy.

TMC911: Advanced Studies in Life Skills, Strategies and Principles II (1 Unit)
The topics in this course include: Introduction; Man as a Tripartite Being (Body, Soul and Spirit); Self-Discovery and the Making of a Total Man; Integrity and Character Development; Biographical Studies; Introduction to Leadership Development; Christian Work Ethics; Vision Building; and Leadership Virtues and Dispositions.

BIF937: Basic Biological Concepts (3 Units)
This course provides a brief introduction to cell structure, biological molecules (DNA, RNA, protein) and their structures, central dogma, and genes. The course also covers genomes: organisation in domains of life; DNA and genome sequencing; gene mapping; annotation; gene regulation; transcription and translation; an overview of multi-omics and systems biology: functional genomics, comparative genomics and genome visualisation.

BIF941: Advanced Biostatistics (3 units)
This course provides an overview of biostatistics, data types and presentation, and probability distributions with applications. Its scope also includes: expectation and variance of probability distributions and random variables; uniform and simulation; multivariate distributions; population; sample size calculation of size and evaluation of the power function; sampling distribution; and research design. Additional aspects of this course include: transformations of a random variable; central limit theorem; approximations; analysis of variance (ANOVA), particularly, one way and two way ANOVA, combination, permutation, correlation and regression. BIF941 further provides an overview of parametric and non-parametric tests, and measures of central tendency. Students are also introduced to chi-square goodness of fit test and chi-square test of independence; statistical packages in R software; Markov Chain Monte Carlo; Bayesian statistics; maximum likelihood; analysis of molecular variance, growth curves, probit and logit models; and potency/efficacy determination.

BIF943 (formerly CSC943): Computational Molecular Biology (3 Units)
The contents of this course are as follows: basic concepts of molecular biology; importance of bioinformatics; pair-wise sequence alignment (dynamic programming, heuristic methods and similarity matrices); multiple sequence alignment; BLAST; FASTA; Hidden Markov Model (Construction, application in alignment and gene prediction); phylogenetic tree; fragment assembly; physical mapping; combinatoric application in sequencing; sequence analysis and annotating; genomic rearrangements; and computational gene finding. The course also covers RNA secondary structure prediction; protein homology modelling; protein threatening; protein molecular dynamic; protein as initial structure prediction; integration of molecular biology data banks; and experimentation biology support (sequence, structure prediction, DNA arrays), etc.

BIF945: High-Throughput and Virtual Screenings (3 Units)
In this course, students learn sequencing technologies; *de novo* assembly and principles of genome assembly; applications of high throughput sequencing: *de novo* assembly, DNA-seq, RNA-seq, ChIP-seq and variant calling. The course also covers file formats and quality checks; sequence mapping: mapping problems caused by repeats, duplications, spliced alignment, re-calibration; sequence assembly: quality assessment; basic graph theory; design and deployment of high performance computational infrastructures for the analyses of next generation sequencing (NGS) data; metagenomics; cyber-environments for the processing and analyses of NGS data: web-based environment (Galaxy, KBase and commercial systems); cloud computing; genome browsers: canned workflows and workflow managers; integrating infrastructures for sequencing and analyses.

BIF947: Seminar 1 - Current Topics in Bioinformatics (3 Units)
The course provides a review of current work and theories in bioinformatics. Emphasis is placed on latest work and theories in bioinformatics, computational biology, etc. Each student is expected to present a seminar on any chosen topic.

CSC945: ICT and Research Methodology (3 Units)
This course provides students with an overview of research methodologies and sampling techniques. It also comprises an introduction to informatics research; an overview of empirical research methods; and technical writing– conducting literature reviews, problem formulation and synthesis, ethics of ICT research.

CSC946: Data Mining and Warehousing (3 Units)
This course covers data warehouse and OLAP technology for data mining; data mining primitives; languages and system architecture; concept description; mining association rules in large database classification and prediction problems; cluster analysis; mining complex types of data; applications and trends in data mining; data mining algorithms: apriori, hybrid apriori, COFI-tree, FP-tree, P-tree, inverted matrix; introduction to mining relation; text; sequence; time-series; web and multimedia data.

CSC948: Seminar 2 - Technical Report Writing (3 Units)
Each student is expected to submit a bound hard copy of the content of the seminar that was presented in BIF947.

BIF933: Advanced Population Genetics and GWAS (3 Units)
This course involves an overview of the basic concepts of population genetics: allele and genotype frequencies; linkage disequilibrium; Hardy-Weinberg equilibrium; identity by descent (IBD); pedigrees and trios; selection; drift; mutation; and gene flow. The scope of the course also covers models for population admixture: principal component analyses; clustering analyses; and ancestry inference. Other aspects of the course are: haplotype phasing by IBD; SNP tagging; coalescent and statistics; statistical analyses of quantitative genetics: QTL mapping; microarray data analyses; SNP-genotyping; genome wide association studies: disease models, GWAS in case-control design, transmission disequilibrium test, population substructure, and missing heretability problem. The course content further includes GWAS data interpretation; GWAS vs. next generation sequencing; case studies of combined statistical genetics and systems biology.

BIF935: Advanced Biological Database Management Systems (3 Units)
The course includes the following: an introduction to biological data types, importance of metadata, and database concepts: file systems and database; an overview of biological database classification and structures, and bioinformatics databases with examples; enhanced E-R model; distributed database management systems (DDMS); database privacy, security, failure and recovery; object-oriented databases; client/server systems; web database development and database administration; indexing and performance issues in biological databases; SQL or MySQL as relational database language; database administration; current trends in biological database management systems.

BIF955: Infectious and Non-Infectious Diseases (3 Units)
Students should expect the following in this course: distinction between infectious and non-infectious diseases; contributions of genetic, physiological, environmental and behavioural factors to these diseases (with examples); tropical and neglected tropical diseases; infectious diseases: biology, agents, zoonotic diseases, epidemics, endemics, pandemics, outbreaks, and genetic identification; metagenomics. Students should also expect the course to cover non-infectious diseases: key facts and risk factors, prevention and control and their

prevalence. Such diseases include: cardiovascular diseases; diabetes; chronic respiratory diseases; and mental health disorders. This course further includes cytogenetics and genomic identification of congenital anomalies.

BIF957: Advanced Optimisation (3 Units)
The scope of this course is as follows: an overview of basic optimisation techniques and applied optimisation; linear programme; basic transformations; flux balance analysis (FBA): students learn to reconstruct metabolic networks, formulate dynamic mass balance, steady state mass balance, add known constraints, they also learn optimisation. The course further includes flux variability analysis (FVA); consistency checking in metabolic networks: network consistency, trivial and MBA algorithms; absolute value case; linear, integer and mixed integer programming and their applications in genetics and biological systems; use of Gurobi software; indicator and semi-continuous variables; strength of a model; products of binary and real variables; disjunctions and replacing integers with binaries; non-linear optimisation techniques; modelling: branch and cut, and Lagrangian relaxation techniques. Finally, the course explores current trends in optimisation.

BIF959: Geographic Information Systems and Remote Sensing (2 Units)
This course explores the basics of Geographic Information System (GIS) and remote sensing. It provides an overview of data models and coordinate reference systems; data collection procedures; visualisation and presentation; and an introduction to map design and cartography. Other aspects of the course are: spatial analysis— buffer, clip, interpolation; remote sensing— data characteristics, data acquisition, sensors and data sources; software for data visualisation— ArcGIS, QGIS; and applications of GIS and remote sensing. Students will also conduct practical examples with one of the software for data visualisation.

BCH933: Topics in Cancer Research (3 units)
This course covers the following: cellular molecular and clinical aspects of cancer; pathological basis of cancer; molecular cancer epidemiology, prevention, and control (basic science research and applied behavioural, social, and population sciences to reduce cancer risk, incidence, morbidity and mortality, and improve quality of life); health disparities in cancer (biological/genetic/genomic/epigenetic basis for observed cancer susceptibility/response to therapy and unequal burdens of cancer across racial/ethnic populations); clinical survey of common human cancers (natural history, biology, and treatment); principles and practices of behavioural science in cancer control (application of social, psychological, behavioural, and translational research from cancer diagnosis to survivorship); epigenetic mechanisms and environmental impact; translational bioinformatics and approaches in cancer biology; infectious diseases/inflammation and cancer; cancer biomarkers and therapeutics.

CHM912 - Advanced Applied Spectroscopy (3 Units)
This course surveys recent advances in applied atomic and molecular spectroscopy. This will involve a comprehensive literature search, treatment of theories, and applications of such new spectroscopic techniques.

CHM916 - Selected Topics in Heterocyclic Chemistry (3 Units)
Students work on selected subjects from current literature and specialised topics currently of research interest to available postgraduate staff.

CHM931 - Methods for Environmental and Industrial Analysis (3 Units)
This course covers the philosophy of modern instrumental methods used for environmental and industrial analysis. The topics to be covered include quality control and quality assurance, good laboratory practices, waste minimisation and elimination, safe laboratory operation, ISO standards, EPA, methodology, and statistical data analysis.

CSC941: Cluster and Grid Computing (3 Units)
The purpose of the course is to provide basic knowledge on the most important principles, methods, tools, systems, standards, etc. of cluster and grid technologies. The course is aimed at bridging the gap in university education between the distributed and high performance topics in the fields of computer science and engineering. It also focuses on the current hot research topics and activities of the fields.
The course outline is as follows:
Introduction to Distributed and High-Performance Computing; Basic Terms: Distributed Computing, HPC, HPCC, Network Computing, Internet Computing, Cluster, Grid, Meta-Computing, Middleware, etc.; Milestones of the History, Some Representative Applications; Classification: Taxonomies, MPP, SMP, CC-NUMA, Cluster: Dedicated High Performance (HP), High Availability (HA), CoPs, PoPs, CoWs; Distributed, On-Demand, High-Throughput, Collaborative, Data-Intensive Computing; Basics of Communication Media and Protocols: TCP/IP, Internet2, Quality of Service (QoS), ATM, Fast Ethernet, etc.; Programming Models: Message Passing, Client-Server, Peer-To-Peer, Broker Computing, Code Shipping, Proxy Computing, Mobile Agents; Toolkit and Object-Oriented (OO) Systems; Higher Level Communication: Light-Weight Communication, Sockets, Standard APIs, Active Messages; Storage and File Problems: Network Ram, Raid and Software Raid; Distributed File Systems: Network File System (NFS), AFS, OSF-DSF, RSF; Message Passing Standards: PVM (Parallel Virtual Machine), MPI (Message Passing Interface); Object-Oriented De Facto Standards CORBA and DCOM; Java-Based Methods: JVM, Remote Method Invocation (RMI), Bytecode, Applet and Servlet, Javabean and Javaspaces, Jini; Grid Toolkit Approach: Globus Hourglass Concept, Communication, Resource and Process Management, Data Access, Security; Object-Oriented Approach: Legion Language Support, Component Wrapping, Programme Support, Resource Management; Security: Confidentiality, Integrity and Availability; Authentication, Authorisation, Assurance, Auditing, Accounting; Scheduling: Algorithms, Policies and Techniques, High Performance and High Throughput Schedulers, Resource Scheduling; and Grid Monitoring: Tasks, Types, Architecture, Components.

Other things to note: The course requires each student to make presentation on a topic that they select. Students are provided a reading list and copies of slides presented at the lectures in PDF or .ps format.MPP, SMP, CC-NUMA, Cluster: Dedicated High Performance (HP), High Availability (HA), CoPs, PoPs, CoWs.

CSC967: Computer Programming I (0 Unit)
This course introduces problem solving methods and algorithm development. Its scope covers designing, coding, debugging, and documenting programmes using techniques of a good programming language style. Students are taught programming language and programming algorithm development with a widely used programming language such as C/C++.

CSC968: Fundamental of Data Structure (0 Unit)
For this course, students are exposed to primitive types, arrays, records, strings and string processing. They also learn data representation in memory, stack and heap allocation, queues, and trees. In addition to these, they learn implementation strategies for stack, queues, and trees; run-time storage management; pointers and references; and linked structure.

CSC969: Artificial Intelligence: (0 Unit)
This course provides an introduction to artificial intelligence, facilitates students' understanding of natural languages, knowledge representation, expert systems, pattern recognition, the language LISP.

BCH953: Advanced Molecular Biology and Bioinformatics (0 Unit)
Aspects of this course include: organisation of gene structure in prokaryotes and eukaryotes; gene expression— DNA replication, transcription, translation and genetic code; bacteriophages and eukaryotic viruses (structure, life cycles, biological assays etc.); mutation and mutagenesis; DNA repair mechanisms; genes and cancer; recombination; plasmids and transposoons; restriction enzymes; techniques in molecular biology— PCR, microarray, etc; basic concepts of biotechnology; history and evolution of biotechnology; the inter-disciplinary nature of biotechnology; introduction to the principles and techniques in biotechnology; applications of biotechnology in medicine, food/agriculture, industries, and environment; and genetic modification.
Other aspects of the course include: introduction to bioinformatics— historical perspectives, definitions, and impact of genomics on problems in molecular and cellular biology; sequence driven and data driven problems; databases; algorithms for the acquisition and analysis of information from DNA— sequence similarity, sequence alignment and multiple sequence alignment, string alignment and algorithms; genome organisation; structure and function of the genome, with emphasis on gene mapping and sequencing projects**;** genomic analysis; and proteomics.

Ph.D. I – OMEGA SEMESTER COURSES

CSC977: Operating System I (0 unit)
Topics covered include: An Overview of O/S: Role & Purpose; Functionality Mechanisms to Support Client-Server Models; Hand-Held Devices; Design Issues; Influences of Security; Networking; Multimedia; Windows; O/S Principles: Structuring Methods Abstraction, Processes and Recourses; and The Concept of APIS Device Organisation Interrupts.

CSC978: Computer Programming II (0 Unit)
Aspects of this course include: principles of good programming; structured programming concepts; debugging and testing; string processing; internal searching and sorting; and recursion. Students also learn to use a programming language that is different from that learnt in CSC 201, e.g. C# or VB.net.

CSC979: Computer Architecture and Organisation I (0 Unit)
The course contents include: fundamental building blocks; logic expressive immunisation; sum of product forms; register transfer notation; physical considerations; data representation and number bases; fixed and floating point systems; and representation memory systems organisation and architecture.

7.2.7 Staffing Requirements

Table 11 List of Academic Staff Involved in Teaching and Supervision of Postgraduate Studies in the Department

S/N	NAME	ACADEMIC QUALIFICATION	PROFESSIONAL QUALIFICATION	DESIGNATION	AREA OF SPECIALISATION
1.	Prof. V. C. Osamor	B.Sc., PGD, M.Sc., Ph.D.	ASBCB, MTA, MNCS, MCPN, ISCB, MCNS	Professor/ HOD	Computer Science/Bioinformatics, Big Data, Artificial Intelligence, Graphics
2.	Prof. C. K. Ayo	B.Sc., M.Sc., Ph.D.	MNCS, MCPN, MCP, CCNA	Professor	Computer Science/MIS, e-Voting Big data, Software Engineering
3.	Prof. E. F. Adebiyi	B.Sc., M.Sc., Ph.D.	MNCS, MCPN, ASBCB, ISCB, NISEB	Professor	Computer Science/Bioinformatics
4.	Prof. A. A. Adebiyi	B.Sc., MBA, M.Sc., Ph.D.	MNCS, MCPN	Professor	MIS/Artificial Intelligence
5.	Prof. A. A. Azeta	B.Sc., M.Sc., Ph.D.	MNCS, MCPN	Professor	Computer Science/ Software Engineering/ Artificial Intelligence
6	Dr. O. J. Oyelade	B.Sc., M.Sc., Ph.D.	ASBCB, MNCS, MCPN	Associate Professor	Computer Science/ Bioinformatics
7.	Dr. (Mrs.) O. O. Oladipupo	B.Sc., M.Sc., Ph.D.	MNCS, MCPN	Associate Professor	Computer Science/Artificial Intelligence
8	Dr. I. A. Odun-Ayo	B.Sc., M.Sc., Ph.D.		Senior Lecturer	Computer Science/Cloud Computing
9	Dr. Mrs. M.O. Adebiyi	B.Sc., MSc., Ph.D.	ISCB, ASBCB, IEEE, MNCS	Senior Lecturer	Computer Science/Bioinformatics
10.	Dr. I. T. Afolabi	B.Sc., M.Sc., Ph.D.	MNCS, MCPN	Senior Lecturer	Computer Science/Text mining
12.	Dr. A. A. Oni	B.Sc., M.Sc., Ph.D.		Senior Lecturer	MIS/Data Mining/ICT Adoption
13	Dr. S. R. Okuboyejo	B.Sc., M.Sc., Ph.D.		Lecturer I	MIS/Data Mining
14	Dr. O. Iheanatu	B.Eng., M.Sc. Ph.D.		Lecturer II	MIS/ Text mining/ Artificial Intelligence
15	Dr. O. Emebo	B.Sc., M.Sc., Ph.D.		Lecturer II	Computer Science/Artificial Intelligence, Software Engineering
16	Dr. A. O. Adewumi	B.Sc. M.Sc., Ph.D.		Lecturer II	Computer Science/Software Engineering/Artificial Intelligence
17	Dr. I. Isewon	B.Sc. M.Sc., Ph.D.		Lecturer II	Computer Science/Bioinformatics

ADJUNCT LECTURERS					
1.	Prof. Chinonye Moses	B.Sc., M.Sc., Ph.D.		Professor	EDS
2.	Dr. Tuesday Owoeye	B.A., M.A., Ph.D.		Senior Lecturer	TMC

Students' Supervision Requirements

SN	Programme		To Teach	To Supervise	Main Supervisor	Co-Supervisor
1	Master's		Possess Ph.D. (LII-Professor)	Possess Ph.D. (LII-Professor)	N/A	N/A
2	Ph.D.		Possess Ph.D. (LI-Professor) - with minimum of 2 years' experience	Possess Ph.D. (SL-Professor)	SL - Professor (with experience in Ph.D. supervision)	SL- Professor (with experience in Master's supervision)

7.3 COMPUTER AND INFORMATION SCIENCES

7.3.1 Introduction

The Department started in 2002 when the University commenced. Postgraduate programme started in 2003 with two students. There were five postgraduate teachers at the commencement of the programme. However, the Department has graduated 18 Ph.D. students and over 100 Master's students to date.

NUC resource verification and accreditation exercise undertaken by NUC at different times were successful. The Computer Science programme at both M.Sc. and Ph.D. are fully accredited.

The Department is blessed with strong and functional postgraduate departmental committee members consisting of 6 Professors and 5 Senior lecturers.

Vision of the Programme

The programme is committed to becoming internationally recognised for research at the intersections of knowledge domains within computer science and between computer science and other disciplines, especially where such research can empower the human potential in service to science and society. We reinforce, extend and diversify our strengths in interdisciplinary innovation and collaboration while striving to become recognised for addressing critically and scientifically important problems. We are committed to creating a graduate research environment and culture that fosters excellence and diversity and inspires a generation of computer scientists externally visible to the college, university, and international computing communities. Our postgraduate programme at the Master's and Doctoral levels are competitive for faculty appointments at peer or better departments or equivalent industry positions. We continue to achieve and sustain a level of M.Sc. and Ph.D. production competitive with peer departments and meeting college benchmarks.

Mission of the Programme

The mission of our programme is to provide students and faculty with an open environment that fosters professional and personal growth. We prepare our students for successful careers in the computing professions through flexible programmes of study that can be adapted to support individual career goals. We also create and disseminate knowledge through research and education in the theory and application of computing, to better the state and nation, and to equip our students to succeed and contribute to the society.

Philosohpy of the Programme

The Philosophy of the Programme is to nurture graduates and postgraduates students, by leveraging on sound foundational training and skills in the Computer and Information Sciences in order to become globally relevant in the industrial and academic domains, with the goal of supporting the emergence of future leaders in the field of computing. The programme is committed to producing highly creative and innovative postgraduates that are competent enough to be self-employed in the field of Computer Science, Bioinformatics and Computational Biology, Management Information System and its allied disciplines, or in the least be immediately employable.

Aim of the Programme

The Aim of the Programme in the Department of Computer and Information Sciences is to produce computer scientists and information systems analysts whose professional and intellectual capabilities meet the ever-changing challenges of the Information and Communications Technology (ICT) industry in terms of practice, teaching and research.

Objectives of the Postgraduate Programme

Specifically, the objectives of the postgraduate programmes are to:

i. develop postgraduates with skills and knowledge needed to meet the requirements of a rapidly advancing and challenging field of Information and Communications Technology (ICT).
ii. produce postgraduates with IT skills and prepare them for the industry and global competitiveness.
iii. produce highly creative and innovative graduates and postgraduates that are competent enough to be self-employed in the field of Information Technology and its allied disciplines, or in the least be immediately employable.
iv. develop human capital with emphasis on creating a knowledge-based society.
v. develop manpower to pursue careers in a wide range of professions including software development, web design, and system administration, project management, and computational sciences, that would foster the attainment of the Vision of 1 of 10 in 10 and the Sustainable Development Goals.
vi. provide a broad and balanced foundation in Computer Science knowledge and practical skills.
viii. provide students with knowledge and skills base for further studies in computer science or multi-disciplinary studies involving computer science.

Degree Nomenclature

The Department of Computer and Information Sciences offers two postgraduate degree programmes in Computer Science namely:

I. Master of Science (M.Sc.) in Computer Science with options in:
   - Software Engineering
   - Artificial Intelligence, and
   - Bioinformatics.
   - Health Informatics.

b. Doctor of Philosophy (Ph.D.) in Computer Science with options in:
   - Software Engineering

- Artificial Intelligence, and
- Bioinformatics.
- Health Informatics.

7.3.2 Academic Content

7.3.2.1 Admission Requirements

The ordinary level (O/L) requirements includes: Credit level passes in five subjects in the SSCE/GCE/NECO O/L or their equivalent must be obtained in not more than two sittings and must include English Language, Physics, Mathematics, Chemistry, and any other relevant Science subject, Technology, Data Processing, Agriculture, Biology.

I. Master of Science (M.Sc.) Computer Science
Admission Criteria

i. Admission is open to candidates with a good first degree in Computer Science (B.Sc. Computer Science) with a minimum of Second Class Lower Division from Covenant University, or any other University recognised by the senate of Covenant University.
ii. Candidates with third class degree will be deemed eligible if such candidates have obtained a PGD in Computer Science from a recognised university.
iii. Candidates with at least a lower credit in Higher National Diploma (HND) and University PGD with a minimum CGPA of 3.50 may be considered for admission.
iv. In addition to the above qualification requirements, candidates shall be required to participate in a postgraduate screening exercise to qualify for admission.

II. M.Phil./Ph.D. Computer Science
Admission Criteria

i. Admission is open to applicants who possess a Master of Science (M.Sc.) degree in
ii. Computer Science or its equivalent with CGPA of 3.5 - 3.99 from Covenant University or any other recognised University.
iii. A candidate that has demonstrated sufficient academic promise may be considered for
iv. change of registration status from M.Phil. to Ph.D. after the successful completion of two semesters in the M.Phil. programme and having presented at least three seminars (including a proposal defence), in demonstration of that competence, subject to approval by the Faculty/Board of Postgraduate Studies and Senate. Such a candidate must have obtained a minimum CGPA of 4.0 after the two semesters of coursework.
v. In addition to the above qualification requirements, candidates shall be required to participate in a postgraduate screening exercise to qualify for admission.

III. Ph.D. Computer Science by Coursework and Research
Admission Criteria

i. A candidate with academic Master's degree (M.Sc.) in Computer Science, with a cumulative Grade point Average (CGPA) of not less than 4.0 on 5 point scale or weighted average of 60% from a recognised university shall be eligible for admission into the Ph.D. Computer Science programme.
ii. In addition to the above qualification requirements, candidates shall be required to participate in a postgraduate screening exercise to qualify for admission.

7.3.2.2 Areas of Specialisations

i. Software Engineering
ii. Artificial Intelligence
iii. Bioinformatics
iv. Health Informatics

7.3.2.3 Duration of Programme

i. Master of Science (M.Sc.) Computer Science

Full-time M.Sc. Computer Science degree programme shall last for a minimum of four (4) semesters.

ii. M.Phil./Ph.D. Computer Science

Full-time M.Phil./Ph.D. Computer Science programme shall last for a minimum of eight (8) semesters. Two (2) semesters of coursework and six (6) semesters of research.

iii. Ph.D. Computer Science by Coursework and Research

Full-time Ph.D. Computer Science degree programme shall last for minimum of six (6) semesters. One (1) semester of coursework and five (5) semesters of research.

7.3.2.4 Graduation Requirements

i. Master of Science (M.Sc.) Computer Science

A candidate will be required to complete satisfactorily a minimum of **56** prescribed course units (see Table 1). Candidates are to submit and defend orally, a dissertation of original research work on a previously approved topic for internal and external examination.

ii. M.Phil./Ph.D. Computer Science

A candidate will be required to complete satisfactorily a minimum of **62** course units. A candidate, on successful completion of prescribed courses and defence of a research proposal may be recommended to proceed into the Ph.D. programme. To be eligible for conversion into the Ph.D. programme, the M.Phil. candidate must have passed all the stipulated courses with a minimum CGPA of 4.0 and successfully carried out the M.Phil./Ph.D. Proposal defence.

iii. Ph.D. Computer Science by Coursework and Research

The performance of the candidate shall be a combination of performance at coursework, seminars as well as quality of written thesis as well as performance at oral examination. The thesis of original research work on previously approved topic shall be assessed at both internal and external examination and defence. The minimum credit unit for the award of a Ph.D. in Computer Science is **38**.

Table 1: Graduation Requirements

Level	Area/ Option	Core Courses	University Courses	Elective Courses	Ph.D. Proposal/ Post-field	Dissertation /Thesis	Total
M.Sc.		36	2	12		6	56
M.Phil./Ph.D.		33	2	9	6	12	62
Ph.D.		15	2	3	6	12	38

7.3.3 Examination Requirements

7.3.3.1 Course Work

Students are expected to complete a minimum of 56 prescribed course units for M.Sc., 59 course units for M.Phil./Ph.D. and 38 course units for direct Ph.D. Candidates must have passed all the stipulated courses with a minimum CGPA of 4.0 before proceeding to M.Phil./Ph.D. and Ph.D. Proposal defence. Table 1 and 2 contains the classification of grades and graduation requirements for postgraduate programmes respectively.

7.3.3.2 Thesis/Dissertation

Master's thesis/dissertation preparation starts with M.Sc. Project Seminar after acquiring a minimum of 3.0 CGPA and above in course work. Ph.D. thesis preparation commences after obtaining a minimum CGPA of 4.0 and above in Ph.D. course work. Title of thesis should not be longer than 18 characters and Ph.D. thesis should be above 50,000 words.

7.3.4 Course Structure

Table 2: M.Sc. Programme Year 1 by Semesters

M.Sc. I (Computer Science) (1st Year)											
	ALPHA SEMESTER					**OMEGA SEMESTER**					
Compulsory Courses	Course Code	Course Title	Status	Units	Pre-Requisite	Course Code	Course Title	Status	Units	Pre-Requisite	
	CSC811	Advanced Operating Systems	C	3		CSC821	Advanced Computer Architecture	C	3		
	CSC812	Advanced Computer Algorithms	C	3		CSC822	Advanced Programming Languages	C	3		
	CSC813	Advanced Software Engineering	C	3		CSC823	Advanced Internet Technology	C	3		
	CSC814	Advanced Artificial Intelligence	C	3		CSC824	Advanced Computer Communication & Network	C	3		
	CSC815	ICT and Research Methodology	C	3		CSC825	Database Management System	C	3		
	CSC834	Data Science	C	3		CSC857	M.Sc. Seminar	C	3		
	Sub Total			18		*Sub Total*			18		36
University Courses	EDS811	Entrepreneurial Development Studies VIII	U	1							
	TMC811	Advanced Studies in Life Skills, Strategies and Principles I	U	1							
	Sub Total			2							2
	Total			20		Total			18		38

Electives: two electives in the area of Specialisation	*Software Engineering Option (Option 1)* *Select (6 Units) from Electives*					*Software Engineering Option (Option 4)* *Select (6 Units) from Electives*						
	CSC816	Requirements Engineering	E	3		CSC826	Software Testing & Quality Assurance	E	3			
	CSC817	Software Architecture and Design	E	3		CSC827	Mobile and Adaptive Systems	E	3			
	CSC833	Advanced Data Structure	E	3		CSC829	Artificial Neural Networks	E	3			
	CSC834	Cyber Security	E	3								
	CSC835	Machine Learning with Python	E	3								
	CSC836	Probability and Statistics	E	3								
	Sub Total			6		*Sub Total*	6					12
	Total			26		*Total*	24					50
Electives:two electives in the area of Specialisation	*Artificial Intelligence Option (Option 2)* *Select (6 Units) from Electives*					*Artificial Intelligence Option (Option 5)* *Select (6 Units) from Electives*						
	CSC818	Advanced Expert Systems	E	3		CSC828	Natural Language Processing	E	3			
	CSC833	Advanced Data Structure	E	3		CSC829	Artificial Neural Networks	E	3			
	CSC834	Cyber Security	E	3		CSC832	Introduction to Computation	E	3			
	CSC835	Machine Learning with Python	E	3								
	CSC836	Probability and Statistics	E	3								
	Sub Total			6		*Sub Total*			6			12
	Total for Artificial Intelligence			26		***Total***			24			50
Elective	*Bioinformatics Option (Option 3)* *Select (6 Units) from Electives*					*Bioinformatics Option (Option 6)* *Select (6 Units) from Electives*						
	CSC831	Bioinformatics I	E	2		CSC841	Bioinformatics II	E	2			

	CSC832	Introduction to Computation	E	2		CSC829	Artificial Neural Networks	E	2		
	BIF813	Scientific Computing	E	2		BIF822	Population genetics and GWAS	E	2		
	BIF817	Introduction to Biological Concepts	E	2		BIF824	High-throughput sequencing/ Screening and Virtual screening	E	2		
	CSC833	Advanced Data Structure	E	3		BIF846	Biological Database Management System	E	2		
	BCH813	Advanced Molecular Biology & Bioinformatics	E	2							
	CSC834	Cyber Security	E	3							
	CSC835	Machine Learning with Python	E	3							
	CSC836	Probability and Statistics	E	3							
	Sub Total			6		***Sub Total***		**6**			**12**
	Total for Bioinformatics option			**26**		***Total***		**24**			**50**
	Health Informatics Option (Option 4) *Select (6 Units) from Electives*					*Health Informatics Option (Option 6)* *Select (6 Units) from Electives*					
Electives: Two elective in the area of Specialisation	HIT811	Introduction to Health Informatics	E	3		HIT821	Electronic Health Records	E	3		
	HIT812	Health Information Systems	E	3		HIT822	Current Trends in Health Informatics	E	3		

	HIT813	Clinical Decision Support Systems	E	3		HIT823		Data Science and Predictive Analysis	E	3		
	CSC831	Bioinformatics I	E	3		CSC841		Bioinformatics II	E	3		
	CSC835	Machine Learning with Python	E	3								
	CSC836	Probability and Statistics	E	3								
	Sub Total			6		***Sub Total***		**6**				**12**
	Total for Health Informatics option			**26**		***Total***		**24**				**50**

NB:
***C – Compulsory Courses**
***E – Elective Courses**
***CC – Course Code**
***Area of Specialisation here captures three (3) different areas**

Table 3: M.Sc. Year 2 by Semesters

	ALPHA SEMESTER					**OMEGA SEMESTER**					
Compulsory Courses	Course Code	Course Title	Status	Units	Pre-Requisite	Course Code	Course Title	Status	Units	Pre-Requisite	
	CSC859	Research/Project Dissertation Begins				CSC859	Research/Project Dissertation Continues	C	6		
		TOTAL					**TOTAL**		6		**6**
										TOTAL	**56**

Table 4. M.Phil./Ph.D. (Direct) Year 1 by Semesters

M.Phil. Year 1											
	ALPHA SEMESTER					**OMEGA SEMESTER**					
Compulsory Courses	Course Code	Course Title	Status	Units	Prerequisite	Course Code	Course Title	Status	Units	Prerequisite	
	CSC911	Advanced Operating Systems	C	3		CSC941	Cluster & Grid Computing	C	3		
	CSC912	Advanced Computer Algorithms	C	3		CSC921	Advanced Database Management System	C	3		
	CSC913	Advanced Software Engineering	C	3		CSC946	Data Mining and Warehousing	C	3		
	CSC914	Advanced Artificial Intelligence	C	3		CSC947	Seminar 1-Current Topics in Computing	C	3		
	CSC915	ICT and Research Methodology	C	3		CSC948	Seminar 2-Technical Report Writing	C	3		
	CSC934	Data Science	C	3							
	Sub Total			**18**		**Sub Total**			**15**		**33**
University Courses	EDS911	Entrepreneurial Development Studies VIX	U	1							
	TMC911	Advanced Studies in Life Skills, Strategies and Principles II	U	1							
	Sub Total			**2**							**2**
	Total			**20**					**15**		**35**
	Software Engineering Option (Option 1) Select (6 Units) from Electives					*Software Engineering Option (Option 1) Select (3 Units) from Electives*					
Elective Course	CSC916	Requirements Engineering	E	3		CSC944	Engineering of Intelligent Software Systems	C	3		

	CSC917	Software Architecture and Design	E	3							
	CSC933	Advanced Data Structure	E	3							
	CSC934	Cyber Security	E	3							
	Sub Total			6		**Sub Total**			3		**9**
	Total for software engineering			**26**		***Total***			**18**		**44**
	Artificial Intelligence Option (Option 2) *Select (6 Units) from Electives*					*Artificial Intelligence Option (Option 2)* *Select (3 Units) from Electives*					
	CSC918	Advanced Expert Systems	E	3		CSC933	Advanced Data Structure	E	3		
	CSC919	Machine Learning	E	3		CSC934	Cyber Security	E	3		
	Sub Total			6					3		**9**
	Total			**26**					**18**		**44**
	Bioinformatics Option (Option 3) *Select (6 Units) from Electives*					*Bioinformatics Option (Option 3)* *Select (3 Units) from Electives*					
	CSC931	Bioinformatics I	E	2		CSC943	Computational Molecular BiologyI	E	3		
	CSC932	Introduction to Computation	E	2		CSC952	Computation and Biostatictics	E	3		
	BIF913	Scientific Computing	E	2							
	BIF917	Introduction to Biological Concepts	E	2							
	CSC933	Advanced Data Structure	E	2							
	BCH913	Advanced Molecular Biology & Bioinformatics	E	2							
	CSC934	Cyber Security	E	2							
	Sub Total			6					3		**9**
	Total for Bioinformatics			**26**					**18**		**44**

	Health Informatics Option (Option 4) *Select (6 Units) from Electives*					*Health Informatics Option (Option 3)* *Select (3 Units) from Electives*					
	HIT911	Introduction to Health Informatics	E	3		HIT941	Knowledge representation and knowledge management	C	3		
	HIT912	Health Information Systems	E	3		HIT942	Emerging trends in health information systems	C	3		
	HIT913	Clinical Decision Support Systems	E	3							
	CSC931	Bioinformatics I	E	3							
	Sub total			**6**					**3**		**9**
	Total for Health Informatics			**26**					**18**		**44**

Table 5. M.Phil. /Ph.D. Year 2 by Semesters

M.Phil./Ph.D.											
	ALPHA SEMESTER					**OMEGA SEMESTER**					
Compulsory Courses	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-Requisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-Requisite**	
	CSC950	College Ph.D. Proposal Defence	C	3							
		TOTAL					**TOTAL**		3		**3**
										TOTAL	**47**

Table 6. M.Phil. /Ph.D. Year 3 by Semesters

M.Phil./Ph.D.											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory Courses	Course Code	Course Title	Status	Units	Pre-Requisite	Course Code	Course Title	Status	Units	Pre-Requisite	
						CC953	College Ph.D. Post-field Defence I	C	3		
		TOTAL					**TOTAL**		3		**3**
										TOTAL	**50**

Table 7. M.Phil. /Ph.D. Year 4 by Semseters

M.Phil./Ph.D.											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory Courses	Course Code	Course Title	Status	Units	Prereq uisite	Course Code	Course Title	Status	Units	Prereq uisite	
						CSC956	Thesis write-up (Ph.D. Final Oral Defence) VIVA	C	12		
		TOTAL					**TOTAL**		12		**12**
										TOTAL	**62**

Table 8: Ph.D. Year 1 by Semesters

Ph.D. Year 1											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory Courses	Course Code	Course Title	Status	Units	Prereq uisite	Course Code	Course Title	Status	Units	Prereq uisite	
	CSC941	Cluster & Grid Computing	C	3		CSC950	College Ph.D. Proposal Defence	C	3		
	CSC945	ICT and Research Methodology	C	3							
	CSC946	Data Mining and Warehousing	C	3							
	CSC947	Seminar 1- Current Topics in Computing	C	3							
	CSC948	Seminar 2- Technical Report Writing	C	3							
	Sub Total			**15**		**Sub Total**			**3**		**18**
University Courses	EDS911	Entrepreneurial Development Studies VIX	U	1							
	TMC911	Advanced Studies in Life Skills, Strategies and Principles II	U	1							
	Sub Total			**2**							
	Total			**20**							**20**

	Software Engineering Option (Option 1) *Select (3 Units) from Electives*					*Software Engineering Option (Option 1)* *Select (3 Units) from Electives*					
Elective Course	CSC916	Engineering of Intelligent Software Systems	C	3							
	Sub Total			3		**Sub Total**					**3**
	Total			**23**		***Total***					**23**
	Bioinformatics Option (Option 3) *Select (3 Units) from Electives*										
	CSC943	Computational Molecular BiologyI	C	3							
	CSC952	Computation and Biostatictics	C	3							
	Sub Total			3							**3**
	Total			**23**							**23**
	Health Informatics Option (Option 3) *Select (3 Units) from Electives*										
	HIT941	Knowledge representation and knowledge management	C	3							
	HIT942	Emerging trends in health information systems	C	3							
	Sub Total			3							**3**
	Total			**23**							**23**

Table 9. Ph.D. Year 2 by semesters

Ph.D.											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory Courses	Course Code	Course Title	Status	Units	Pre-Requisite	Course Code	Course Title	Status	Units	Pre-Requisite	
	CSC95	College Ph.D. Post-field	C	3							
		TOTAL		3			**TOTAL**		3		**3**
										TOTAL	**26**

Table 10. Ph.D. Year 3 by Semesters

M.Phil./Ph.D.											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory Courses	Course Code	Course Title	Status	Units	Pre-Requisite	Course Code	Course Title	Status	Units	Pre-Requisite	
						CSC956	Thesis write-up (Ph.D. Final Oral Defence) VIVA	C	12		
		TOTAL					**TOTAL**		12		**12**
										TOTAL	**38**

7.3.5 Course Description (M.Sc. & M.Phil./Ph.D. and Ph.D.)

7.3.5.1 M.Sc. Courses

EDS811: Entrepreneurial Development Studies VIII
Introduction, Historical Background, Definition of entrepreneurship/entrepreneur, Theories, Types and characteristics; Idea generation, Opportunity Scouting and Exploitation; Environment of Entrepreneurship/Factors that Influence Successful Entrepreneurship; Entrepreneurs and Health Issues; The Concept of Intrapreneurship and Human Capital; Capital Knowledge, ICT and Entrepreneurship; Creativity, Innovation and Sustainable Entrepreneurship; Wealth Creation and Waste Recycling Process; Marketing and Entrepreneurial Marketing; Financing SMEs in Nigeria- a Review of formal and informal financing; Characteristics, Policy/Theoretical Framework and Challenges of Women Entrepreneurship; Social Evidences of Entrepreneurship and Ethics; Academic Entrepreneurship, Intellectual Property and R&D; Feasibility Report and Business Plan

TMC811: Advanced Studies in Life Skills, Strategies and Principles I
Introduction; Man as a Tripartite Being (Body, Soul and Spirit); Self-Discovery and the Making of a Total Man; Integrity and Character Development; Biographical Studies; Introduction to Leadership Development; Christian Work Ethics; Vision Building; Leadership Virtues and Dispositions

CSC811: Advanced Operating Systems (3 Units)
Structural design aspects of operating system: process model, inter-protocol communication, synchronisation mechanisms, resources management, and scheduling. Protection issues. Implementation issues of modern operating systems. Distributed operating systems. Deadlock detection, recovery, and avoidance, Case studies, Project(s).

CSC812: Advanced Computer Algorithms (3 units)
Review of data structures; linear data structures, hashing, tress, graphs, recursion. Complexity classes; empirical measurements of performance; time and space trade-offs analysis. Algorithmic strategies: brute-force algorithms; greedy algorithms; divide-and-conquer; backtracking, branch-and –bound; minimum spanning tree, heuristics; pattern matching and string/ text algorithm; numerical approximation algorithms. Tractable and intractable problems.

CSC813: Advanced Software Engineering (3 Units)
Software engineering and its place as an engineering discipline. Life cycle of software system: Requirements analysis, development, operation and maintenance. Software metrics: Portability, Re-usability, Correctness, Reliability, Efficiency, Usability, Integrity, Maintainability and Flexibility. Software quality and testing. Software architecture: architecture description languages, pattern-oriented software architecture, component-based development, distributed software architecture using middleware, enterprise application integration, architecture for mobile and pervasive systems and model driven architecture. Advanced modelling: UML extension mechanisms, object constraint language and model checking. Software project management: Study of interpersonal process decision making styles, problem solving concepts and procedure, creative effort, conflict resolution, leadership and assessment. Concepts of motivation, team work and group dynamics. Software engineering and law: intellectual property law, professional ethics and code of conduct. Patents, trademarks , copyright, trade secrets, privacy and confidentiality , contracts and licensing, government regulations, global legal issues including Internet law and cybercrime. Overview of Open Source Software.

CSC814: Advanced Artificial Intelligence (3 Units)
Introduction to basic programming techniques of artificial intelligence (AI). Domain analysis; representation of knowledge and strategies; control on interference and search development of interactive

intelligence CAI programmes; the role of analogical reasoning. The main contents are symbol manipulations and AI problem solving techniques. Searching methods, informed search methods, game playing. Knowledge and Reasoning: Agents that reason logically, first order logic, building a knowledge base, inference in first-order logic, logical reasoning systems. Languages for AI problem solving: PROLOG, LISP. Acting Locally: Planning, practical planning, planning and acting. Uncertain Knowledge and Reasoning: Uncertainty, probabilistic reasoning systems, making simple decisions. Learning: Learning from observations, learning from neural network, reinforcement learning, and knowledge in learning. Communicating, Perceiving and Acting: Agents that communicate, practical communication in English; perception, robotics.

CSC815: ICT and Research Methodology (3 Units)
Overview of research methodologies, sampling techniques, Introduction to informatics research, overview of empirical research methods, technical writing – conducting literature reviews, problem formulation and synthesis, ethics of ICT research.

CSC816: Requirements Engineering (3 Units)
The importance of requirements; The role of RE in Software Development Lifecycle; Requirements Elicitation; Requirements modelling – functional requirements, modelling requirements, overview of basic modelling paradigms; problem frames, Data flow diagrams (DFD), use cases, UML Class diagrams, Message sequence Charts (MSC), use case scenarios; Requirements Specification - How to write system requirements; Technical requirements from the perspective of developers; Enumerated Requirements; IEEE Standard for Software Requirements Specification; Requirements validation and verification - Criteria for validating requirements document, Validation Techniques, Verification Techniques; Requirements management - Planning, Monitoring Progress, Controlling Progress; Requirements Review Guidelines - Roles and Responsibilities of participants in the RE review.

CSC817: Software Architecture And Design (3 Units)
The Software Architecture process - describing, evaluating, and designing systems at the architectural level. The role of architecture and the architect in the software development cycle. Architectural patterns and tactics, architecture assessment techniques, architecture driven design, and techniques for documenting architectures; Design patterns, Architectural design issues – reliability, performance, availability, scalability, architecture evaluation methods. Case studies of real-world software architectures; Advanced architecture topics - self-adaptation, service-oriented architectures, software-product lines, and product line architectures, domain-specific architectures, and agent-based architectures. Identification of open problems in software architecture**.**

It will introduce architectural patterns and tactics, architecture assessment techniques, architecture driven design, and techniques for documenting architectures. The course will involve design, development, and assessment activities.

CSC818: Advanced Expert Systems (3 Units)
Review of Artificial Intelligence and its place in experts systems. Introduction to expert systems and expert support system. Characteristics of experts systems. Knowledge-based systems. Types of expert systems.

CSC831: Bioinformatics I (3 Units)
Basic concepts of molecular biology, importance of bioinformatics, Concept of Gene and Gene Expression, Microarrays, Sequence Technology, Pair-wise sequence alignment (dynamic programming, heuristic methods and similarity matrices), multiple sequence alignment, BLAST, FASTA, Hidden Markov Model (HMM) (Construction, application in alignment and gene prediction), phylogenetic tree, fragment assembly, physical mapping, combinatoric application in sequencing, sequence analysis and annotating, genomic rearrangements, computational gene finding.

CSC832: Introduction to Computation (3 Units)
Formal languages, Chomsky hierarchy, formal computation and machine models, finite automata, pushdown automata, Turing machines, Church's Thesis, Recursively enumerable sets. Diagonal arguments. Reducibility, complexity classes.

CSC833 Advanced Data Structure (3 Units)
Primitive types, Arrays, Records, Strings and String processing, Data representation in memory, Stack and Heap allocation, Queues, TREES. Implementation Strategies for stack, queues, trees. Run time Storage management; Pointers and References, Linked structure.

BIF813: Scientific Computing (2 Units)
Introduction to Linux operating system, kernel, ssytem library and utilities, scientific computing and programming with Python, multidimensional data arrays, library of scientific algorithms for Python, and current trends in Bioinformatics.

BIF817: Introduction to Biological Concepts (2 Units)
Overview of the components and organisation of the genetic material in all domains of life (viruses, bacteria, archaea, eukaryotes, cells, biological molecules (DNA, RNA, protein) and central dogma, genes, basic molecular genetics, gene expression and regulation analyses in various organisms

BCH813: Advanced Molecular Biology and Bioinformatics (2 Units)
Organisation of Gene structure in prokaryotes and Eukaryotes; Gene expression: DNA replication, transcription, translation and genetic code; Bacteriophages and Eukaryotic viruses (structure, life cycles, biological assays etc.); Mutation and Mutagenesis; DNA repair mechanisms; Genes and cancer; Recombination; Plasmids and Transposoons, Restriction enzymes, Techniques in molecular Biology, PCR, Microarray etc Basic concepts of biotechnology; history and evolution of biotechnology; the inter-disciplinary nature of biotechnology. Introduction to the Principles and techniques in biotechnology. Applications of biotechnology in medicine, food/agriculture, industries and environment. Genetic Modification. Introduction to Bioinformatics: Historical perspectives, definitions, impact of genomics on problems in molecular and cellular biology; sequence driven and data driven problems. Databases, algorithms for the acquisition and analysis of information from DNA: sequence similarity, sequence alignment and multiple sequence alignment, string alignment and algorithms. Genome organisation; structure and function of the genome with emphasis on gene mapping and sequencing projects**,** Genomic Analysis; Proteomics**.**

HIT811: Introduction to Health Informatics (3 Units)
Introduces background knowledge in the field of health informatics and explores its relationship to information sciences. The student will learn basic informatics terminology, the history of the field, the key players involved with health information technology (HIT), and why there is increasing interest in this

relatively new field. Students will understand the federal organisations involved in policy development and the government's strategy for promoting the adoption of HIT through the passing of the Health Information Technology for Economic and Clinical Health (HITECH).

HIT812: Health Information Systems (3 Units)
Applies management principles to identify, evaluate, and implement health services information systems. Discusses the role of information technology and management information systems in the delivery of health services. Emphasis upon how to organise and evaluate effective and efficient computer systems to enhance the functioning of hospitals, physician practices, integrated service delivery systems, managed care organisations and third party payers. Description**:** Introduction to the concepts and practices of health informatics. Topics include: a) major applications and commercial vendors; b) decision support methods and technologies; c) analysis, design, implementation, and evaluation of healthcare information systems; and d) new opportunities and emerging trends.

HIT813: Clinical Decision Support Systems (3 Units)
Applies management principles to identify, evaluate, and implement health services information systems. Discusses the role of information technology and management information systems in the delivery of health services. Emphasis upon how to organise and evaluate effective and efficient computer systems to enhance the functioning of hospitals, physician practices, integrated service delivery systems, managed care organisations and third party payers. Description**:** Introduction to the concepts and practices of health informatics. Topics include: a) major applications and commercial vendors; b) decision support methods and technologies; c) analysis, design, implementation, and evaluation of healthcare information systems; and d) new opportunities and emerging trends.

CSC834: Data Science (3 Units)
Students will learn how to explore new data sets, implement a HOURS comprehensive set of machine learning algorithms from scratch, and master all the components of a predictive model, such as data preprocessing, feature engineering, model selection, performance metrics and hyperparameter optimisation. Predictive Modelling: Regression, Classification, Data Preprocessing, Model Evaluation and Ensembles. Data Mining: Dimensionality Reduction, Clustering, Association Rules, Anomaly Detection, Network Analysis and Recommender Systems. Specialty Topics: Data Engineering.

CSC834: Cybersecurity (3 Units)
Introduction to cybersecurity: the evolution of cybersecurity, cybersecurity & situational awareness, the cybersecurity skills gap. Difference between Information Security & Cybersecurity: protecting digital assets. Cybersecurity objectives: confidentiality, integrity, & availability, Nonrepudiation. Cybersecurity roles: Governance, risk management, & compliance. What does a Cybersecurity professional do? , Information Security roles, Board of Directors, Executive management, Senior Information security management, Cybersecurity practitioners. Cybersecurity domains: Cybersecurity concepts, Security architecture principles, Security of networks, systems, applications, & data, Incident response.

CSC835: Machine Learning with Python (3 Units)
Introduction to soft computing methods – fuzzy logic and fuzzy systems, rough sets, evolutionary algorithms – Genetic Algorithms, Particle Swarm Intelligence, Ant Colony algorithms, Artificial Neural Networks, Bayesian networks, Support Vector Machines, application of soft computing to data mining. Linear regression. Non-linear classification. Recommender problems. Collaborative filtering. Recurrent

Neural Networks. Deep learning. Back propagation. Unsupervised-Clustering. Generative models, mixtures. Reinforcement learning. Applications: Natural Language Processing. Digital recognition with Neural Networks. Python programming: interactive mode, script mode programming, python identifies, reserved words, lines and indentation, multi-line statement, comments in python, using blank lines, waiting for the user, multiple statement on a single line, multiple statement groups as suites. Command line arguments. Data types, identifiers and operators. String manipulation, sequence data types. Sets and dictionary. Control statements. Classes and Objects. Introduction to databases.

CSC836: Probability and Statistics
Probability models and axioms. Sets, sequences, limits, and series. Conditioning and Bayes rule. Independence. Counting. Probability mass functions, and expectations. Variance, Conditioning on an event, multiple random variables. Conditioning on a random variable, independence of random variables. Probability density functions, conditioning of an event, multiple random variables. Conditioning on a random variable, independence, Bayes rule. Derived distributions, Sums of random variables, covariance and correlation. Conditional expectation, and variance revisited, sum of a random number of random variables. Introduction to Bayesian inference, linear models with normal noise. Least mean squares (LMS) estimation. Linear least mean squares (LLMS) estimation. Inequalities, convergence, and the Weak Law of Large Numbers. The Central Limit Theorem (CLT). An introduction to classical Statistics. The Bernoulli process. The Poisson process. More on the Poisson process.
Finite-state Markov chains. Steady-state behaviour of Markov chains. Absorption probabilities and expected time to absorption.

M.SC. II - OMEGA SEMESTER COURSES

CSC 821: Advanced Computer Architecture (3 Units)
Advanced computer architecture including discussion of instruction set design (RISC and CISC), virtual memory system design, memory hierarchies, cache memories, pipelining, vector processing, I/O subsystems, co-processors and multiprocessor architectures. Case studies of current systems. Prerequisite: U.G. Computer Architecture

CSC 822: Advanced Programming Languages (3 Units)
Comparative study of the organisation and implementation of a variety of programming languages and language features. Design principles are explored and applied in a historical review of major languages. Procedural, functional, logic-based, object-oriented and parallel languages. Research issues such as polymorphism, formal semantics and verification explored in depth.

CSC823: Advanced Internet Technology (3 Units)
Introductory to internet, standards and specifications; survey of contemporary Internet technologies; Current Internet tools; Designing and publishing a web server; WWW programming Markup languages; Using alternative protocols in WWW, Adding multimedia features to WWW; Server side programming, client programming and database programming for web; security and privacy.

CSC824: Advanced Computer Communication and Network (3 Units)
Channels and channel capacity; introduction to information theory, sharing network resources, telecommunication 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; CR selective retransmission and flow control; internetworking and 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; OSI 7-layer model; introduction to queue theory; physical media; LAN and bridging; WAN and point-to-point links; routing; addressing and routing in the internet; end-to-end communication in the internet; and application protocols. Cyber space technology: Cybercrime, Cyber Security and models of Cyber Solution.

CSC825: Database Management Systems (3 Units)
A brief introduction to database concepts: file systems and database, and the relational database model; design concepts and implementation: entity relationship (E-R) modelling; normalisation of database tables and structured query language; database design and implementation. Transaction management and concurrency control and distributed database management systems; database privacy, security, failure and recovery. Object-oriented databases; client/server systems; data warehouse; data mining; database in electronic commerce; web database development and database administration.

CSC826: Software Testing and Quality Assurance (3 Units)
Test lifecycle planning, test design & coverage analysis, complexity, levels of testing - unit, integration, system, performance and stress testing. Best practice strategies in software testing such as verification & validation, early lifecycle testing, risk based testing and automation, test automation methods and tools; software quality, software metrics.

CSC827: 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: PANA BLUETOOTH, LANs IEEE802.11, HiperLAN, basic GSM and GPRS network structures and protocol architectures, next generation wireless overview including UMTS, IMT-200 and W-CDMA; mobile IP: mobile IPv4 and mobile IPv6, problem with routing, quality of service and security; overview of use of intelligence in mobile systems and power management issues; file systems: CODA and the like and mobile infrastructure support. 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, programming networking and applications for mobile systems – Android programming, i-Pad programming - , code mobility and control/signalling.

CSC828: Natural Language Processing (3 Units)
In depth study of a few major areas historically considered to be part of artificial intelligence. In particular, detailed coverage will be given to the design considerations involved in the following applications: automatic theorem proving, natural language understanding and machine learning.

CSC829: Artificial Neural Networks (3 Units)
Definition of artificial neural network. Similarities of neural network with human brain. Classification of ANN. Terms used in ANN: Input/output sets, weights, bias or threshold, supervised learning, network training, Convergence process, single layer vs. multilayer perception, Forward and Backward propagation, gradient descent rule. Back-propagation neural network, Variable term used in back propagation neural network: learning rate, momentum, hidden nodes, sigmoid activation function. Back propagation

algorithm of ANN. Design of ANN model, training sets for ANN, test sets for ANN, network testing and performance. Applications of ANN. Programming of ANN, Other ANN models – Radial basis networks, functional link networks, Helman networks, Adaline, Mandaline, Unsupervised learning networks, recurrent networks, Hopfield networks, Boltzmann machine, Self-organising maps (SOM), Hybrid neural network configurations; Learning in ANN – supervised, unsupervised, reinforcement learning, Hebbian learning.

CSC841: Bioinformatics II (3 Units)
Protein as initial structure prediction, protein homology modelling, protein molecular dynamic, RNA secondary structure prediction, integration of molecular biology data banks, experimentation biology support (sequence, structure prediction, DNA arrays etc), Metabolomics, Virtual Screening and Drug discovery.

CSC857: M.Sc. Seminar (3 Units)
Students will participate in departmental seminars and join relevant research clusters. Students' are expected to present two seminars as part of the graduation requirement**.**

BCH824: Advanced Molecular Biology I (2 Units)
Review of pathway of gene expression. Polynucleotide hybridisation and application. Gene mapping and gene organisation. Control of gene expression and differentiation. In-vivo gene transaction and rearrangement. Techniques of in vivo gene manipulation. Peptide Synthesis Core, Genetic Variation and Evolution, The Human Genome, Expression Profiling, Proteome Families, Structural Proteomics, Gene Finding/Gene Structure, Protein function and annotation, nanotechnology.

CSC859: Research / Dissertation II (6 Units)
A student applies different computer algorithms and methodologies to one of the research oriented real life problems. The student should choose one area of computer applications that is related to his area of Specialisation. The students will undertake research under the supervision of their supervisors towards the preparation of a Masters dissertation.

BCH813: Advanced Molecular Biology and Bioinformatics (3 Units)
Organisation of Gene structure in prokaryotes and Eukaryotes; Gene expression: DNA replication, transcription, translation and genetic code; Bacteriophages and Eukaryotic viruses (structure, life cycles, biological assays etc.); Mutation and Mutagenesis; DNA repair mechanisms; Genes and cancer; Recombination; Plasmids and Transposoons, Restriction enzymes, Techniques in molecular Biology, PCR, Microarray etc. Basic concepts of biotechnology; history and evolution of biotechnology; the inter-disciplinary nature of biotechnology. Introduction to the Principles and techniques in biotechnology. Applications of biotechnology in medicine, food/agriculture, industries and environment. Genetic Modification. Introduction to Bioinformatics: Historical perspectives, definitions, impact of genomics on problems in molecular and cellular biology; sequence driven and data driven problems. Databases, algorithms for the acquisition and analysis of information from DNA: sequence similarity, sequence alignment and multiple sequence alignment, string alignment and algorithms. Genome organisation; structure and function of the genome with emphasis on gene mapping and sequencing projects**,** Genomic Analysis; Proteomics**.**

BIF822: Population Genetics and GWAS (2 Units)
Fundamentals of genetics: linkage disequilibrium, Hardy-Weinberg Equillibrium, selection, drift, mutation, demography, population structure, models for population admixture, haplotype phasing, SNP

tagging, Coalescent and statistics, quantitative genetics, QTL mapping, statistical analyses of quantitative genetics, SNP-genotyping, Genome wide association studies, basic systems biology.

BIF824: High Throughput Sequencing/Screening and Virtual screening (2 Units)
Basic background of sequncing technologies, applications of high throughput sequencing, whole exome sequencing versus whole genome sequencing, introduction to file formats and quality checks, sequencing mapping and assembly, ChIP-seq, re-sequencing and variant analyses, design and deployment of high performance computational infrastructures for the analyses of next generation sequencing (NGS) data, metagenomics, cyberenvironments for the processing and analyses of NGS data (cloud computing, genome browser, Galaxy, KBase and commercial systems, workflows and workflow managers, integrating infrastructures for sequencing and analyses, Practicals.

HIT821: Electronic Health Records (3 Units)
Data Elements, patient care, patient's medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, and laboratory and test results. Allow access to evidence-based tools that providers can use to make decisions about a patient's care. Automate and streamline provider workflow.

HIT822: Current Trends in Health Informatics (3 Units)
Healthcare technology, Privacy and Security, Information governance, Interoperability, Data analytics.

HIT823: Data Science and Predictive Analysis (3 Units)
The Data Science and Predictive Analytics (DSPA) course (offered as a massive open online course, MOOC, as well as a traditional University of Michigan class) aims to build computational abilities, inferential thinking, and practical skills for tackling core data scientific challenges. It explores foundational concepts in data management, processing, statistical computing, and dynamic visualisation using modern programming tools and agile web-services. Concepts, ideas, and protocols are illustrated through examples of real observational, simulated and research-derived datasets. Some prior quantitative experience in programming, calculus, statistics, mathematical models, or linear algebra will be necessary. This open graduate course will provide a general overview of the principles, concepts, techniques, tools and services for managing, harmonizing, aggregating, preprocessing, modelling, Analysing and interpreting large, multi-source, incomplete, incongruent, and heterogeneous data (Big Data). The focus will be to expose students to common challenges related to handling Big Data and present the enormous opportunities and power associated with our ability to interrogate such complex datasets, extract useful information, derive knowledge, and provide actionable forecasting. Biomedical, healthcare, and social datasets will provide context for addressing specific driving challenges. Students will learn about modern data analytic techniques and develop skills for importing and exporting, cleaning and fusing, modelling and visualising, Analysing and synthesising complex datasets. The collaborative design, implementation, sharing and community validation of high-throughput analytic workflows will be emphasised throughout the course.

7.3.5.2 M.Phil./Ph.D. Courses

EDS811: ENTREPRENEURIAL DEVELOPMENT STUDIES VIII
Introduction, Historical Background, Definition of entrepreneurship/entrepreneur, Theories, Types and characteristics; Idea generation, Opportunity Scouting and Exploitation; Environment of Entrepreneurship/Factors that Influence Successful Entrepreneurship; Entrepreneurs and Health Issues; The Concept of Intrapreneurship and Human Capital; Capital Knowledge, ICT and Entrepreneurship; Creativity, Innovation and Sustainable Entrepreneurship; Wealth Creation and Waste Recycling Process; Marketing and Entrepreneurial Marketing; Financing SMEs in Nigeria- a Review of formal and informal financing; Characteristics, Policy/Theoretical Framework and Challenges of Women Entrepreneurship;

Social Evidences of Entrepreneurship and Ethics; Academic Entrepreneurship, Intellectual Property and R&D; Feasibility Report and Business Plan

TMC811: Advanced Studies in Life Skills, Strategies and Principles I
Introduction; Man as a Tripartite Being (Body, Soul and Spirit); Self-Discovery and the Making of a Total Man; Integrity and Character Development; Biographical Studies; Introduction to Leadership Development; Christian Work Ethics; Vision Building; Leadership Virtues and Dispositions

CSC911: Advanced Operating Systems (3 Units)
Structural design aspects of operating system: process model, inter-protocol communication, synchronisation mechanisms, resources management, and scheduling. Protection issues. Implementation issues of modern operating systems. Distributed operating systems. Deadlock detection, recovery, and avoidance, Case studies, Project(s). System support for Internet-scale computing.

CSC912: Advanced Computer Algorithms (3 units)
Review of data structures; linear data structures, hashing, tress, graphs, recursion. Complexity classes; empirical measurements of performance; time and space tradeoffs analysis. Algorithmic strategies: brute-force algorithms; greedy algorithms; divide-and-conquer; backtracking, branch-and –bound; minimum spanning tree, heuristics; pattern matching and string/ text algorithm; numerical approximation algorithms. Tractable and intractable problems. Network flow.

CSC913: Advanced Software Engineering (3 Units)
Software engineering and its place as an engineering discipline. Life cycle of software system: Requirements analysis, development, operation and maintenance. Software metrics: Portability, Re-usability, Correctness, Reliability, Efficiency, Usability, Integrity, Maintainability and Flexibility. Software quality and testing. Software architecture: architecture description languages, pattern-oriented software architecture, component-based development, distributed software architecture using middleware, enterprise application integration, architecture for mobile and pervasive systems and model driven architecture. Advanced modelling: UML extension mechanisms, object constraint language and model checking. Software project management: Study of interpersonal process decision making styles, problem solving concepts and procedure, creative effort, conflict resolution, leadership and assessment. Concepts of motivation, team work and group dynamics. Software engineering and law: intellectual property law, professional ethics and code of conduct. Patents, trademarks , copyright, trade secrets, privacy and confidentiality, contracts and licensing, government regulations, global legal issues including Internet law and cybercrime. Overview of Open Source Software. Emerging technologies such as security engineering, service-oriented software engineering, and aspect oriented software engineering.

CSC914: Advanced Artificial Intelligence (3 Units)
Introduction to basic programming techniques of artificial intelligence (AI). Domain analysis; representation of knowledge and strategies; control on interference and search development of interactive intelligence CAI programmes; the role of analogical reasoning. The main contents are symbol manipulations and AI problem solving techniques. Searching methods, informed search methods, game playing. Knowledge and Reasoning: Agents that reason logically, first order logic, building a knowledge base, inference in first-order logic, logical reasoning systems. Languages for AI problem solving: PROLOG, LISP. Acting Locally: Planning, practical planning, planning and acting. Uncertain Knowledge and Reasoning: Uncertainty, probabilistic reasoning systems, making simple decisions. Learning: Learning from observations, learning from neural network, reinforcement learning, and knowledge in

learning. Communicating, Perceiving And Acting: Agents that communicate, practical communication in English; perception, robotics. Self-Play; Generative Adversarial Networks..

CSC915: ICT and Research Methodology (3 Units)
Overview of research methodologies, sampling techniques, Introduction to informatics research, overview of empirical research methods, technical writing – conducting literature reviews, problem formulation and synthesis, ethics of ICT research.

CSC916: Requirements Engineering (3 Units)
The importance of requirements; The role of RE in Software Development Lifecycle; Requirements Elicitation; Requirements modelling – functional requirements, modelling requirements, overview of basic modelling paradigms; problem frames, Data flow diagrams (DFD), use cases, UML Class diagrams, Message sequence Charts (MSC), use case scenarios; Requirements Specification - How to write system requirements; Technical requirements from the perspective of developers; Enumerated Requirements; IEEE Standard for Software Requirements Specification; Requirements validation and verification - Criteria for validating requirements document, Validation Techniques, Verification Techniques; Requirements management - Planning, Monitoring Progress, Controlling Progress; Requirements Review Guidelines - Roles and Responsibilities of participants in the RE review. Requirement traceability. Baselines and their uses.

CSC917: Software Architecture and Design (3 Units)
The Software Architecture process - describing, evaluating, and designing systems at the architectural level. The role of architecture and the architect in the software development cycle. Architectural patterns and tactics, architecture assessment techniques, architecture driven design, and techniques for documenting architectures; Design patterns, Architectural design issues – reliability, performance, availability, scalability, architecture evaluation methods. Case studies of real-world software architectures; Advanced architecture topics - self-adaptation, service-oriented architectures, software-product lines, and product line architectures, domain-specific architectures, and agent-based architectures. Identification of open problems in software architecture. Constraints on Software Architecture. It will introduce architectural patterns and tactics, architecture assessment techniques, architecture driven design, and techniques for documenting architectures. The course will involve design, development, and assessment activities.

CSC918: Advanced Expert Systems (3 Units)
Review of Artificial Intelligence and its place in experts systems. Introduction to expert systems and expert support system. Characteristics of experts systems. Knowledge-based systems. Types of expert systems. Expert system implementation and testing.

CSC919: Machine Learning (3 Units)
Introduction to soft computing methods – fuzzy logic and fuzzy systems, rough sets, evolutionary algorithms – Genetic Algorithms, Particle Swarm Intelligence, Ant Colony algorithms, Artificial Neural Networks, Bayesian networks, Support Vector Machines, application of soft computing to data mining. Language learning.

CSC921: Advanced Database Management Systems (3 Units)
E/R Model, Relational Model and Algebra, SQL, Functional Dependencies and Relational Database Design, Storage and File Systems, Tree and Hash Indexes, Query Processing and Implementation of Relational Operators, Query Optimisation, Physical Database Design, Transactions, Concurrency Control

Protocols. Introduction to Distributed Databases: Distributed DBMS (DDBMS) evolution, DDBMS components, Distribution transparency, Transaction transparency, Remote request, Remote transaction, Distributed transaction, Distributed request, 2PC protocol. Databases and Web Technologies: Client-server model: PHP, or Java, or ASP.Net. Database development with Microsoft Access, or Microsoft SQL server or Oracle DB.

CSC931: Bioinformatics I (3 Units)
Basic concepts of molecular biology, importance of bioinformatics, Concept of Gene and Gene Expression, Microarrays, Sequence Technology, Pair-wise sequence alignment (dynamic programming, heuristic methods and similarity matrices), multiple sequence alignment, BLAST, FASTA, Hidden Markov Model (HMM) (Construction, application in alignment and gene prediction), phylogenetic tree, fragment assembly, physical mapping, combinatoric application in sequencing, sequence analysis and annotating, genomic rearrangements, computational gene finding.

CSC933: Advanced Data Structure (3 Units)
Primitive types, Arrays, Records, Strings and String processing, Data representation in memory, Stack and Heap allocation, Queues, TREES. Implementation Strategies for stack, queues, trees. Run time Storage management; Pointers and References, Linked structure. Recusion, Graph and Binary Tree.

CSC932: Introduction to Computation (3 Units)
Formal languages, Chomsky hierarchy, formal computation and machine models, finite automata, pushdown automata, Turing machines, Church's Thesis, Recursively enumerable sets. Diagonal arguments. Reducibility, complexity classes. Grammar and Algorithms.

BIF913: Scientific Computing (2 Units)
Introduction to Linux operating system, kernel, ssytem library and utilities, scientific computing and programming with Python, multidimensional data arrays, library of scientific algorithms for Python, and current trends in Bioinformatics.

BIF917: Introduction to Biological Concepts (2 Units)
Overview of the components and organisation of the genetic material in all domains of life (viruses, bacteria, archaea, eukaryotes, cells, biological molecules (DNA, RNA, protein) and central dogma, genes, basic molecular genetics, gene expression and regulation analyses in various organisms

BCH913: Advanced Molecular Biology and Bioinformatics (3 Units)
Organisation of Gene structure in prokaryotes and Eukaryotes; Gene expression: DNA replication, transcription, translation and genetic code; Bacteriophages and Eukaryotic viruses (structure, life cycles, biological assays etc.); Mutation and Mutagenesis; DNA repair mechanisms; Genes and cancer; Recombination; Plasmids and Transposoons, Restriction enzymes, Techniques in molecular Biology, PCR, Microarray etc Basic concepts of biotechnology; history and evolution of biotechnology; the inter-disciplinary nature of biotechnology. Introduction to the Principles and techniques in biotechnology. Applications of biotechnology in medicine, food/agriculture, industries and environment. Genetic Modification. Introduction to Bioinformatics: Historical perspectives, definitions, impact of genomics on problems in molecular and cellular biology; sequence driven and data driven problems. Databases, algorithms for the acquisition and analysis of information from DNA: sequence similarity, sequence alignment and multiple sequence alignment, string alignment and algorithms. Genome organisation; structure and function of the genome with emphasis on gene mapping and sequencing projects**,** Genomic Analysis; Proteomics**.**

HIT911 Introduction to Health Informatics (3 Units)
Introduces background knowledge in the field of health informatics and explores its relationship to information sciences. The student will learn basic informatics terminology, the history of the field, the key players involved with health information technology (HIT), and why there is increasing interest in this relatively new field. Students will understand the federal organisations involved in policy development and the government's strategy for promoting the adoption of HIT through the passing of the Health Information Technology for Economic and Clinical Health (HITECH)

HIT912 Health Information Systems (3 Units)
Applies management principles to identify, evaluate, and implement health services information systems. Discusses the role of information technology and management information systems in the delivery of health services. Emphasis upon how to organise and evaluate effective and efficient computer systems to enhance the functioning of hospitals, physician practices, integrated service delivery systems, managed care organisations and third party payers. Description**:** Introduction to the concepts and practices of health informatics. Topics include: a) major applications and commercial vendors; b) decision support methods and technologies; c) analysis, design, implementation, and evaluation of healthcare information systems; and d) new opportunities and emerging trends.

HIT913 Clinical Decision Support Systems (3 Units)
Applies management principles to identify, evaluate, and implement health services information systems. Discusses the role of information technology and management information systems in the delivery of health services. Emphasis upon how to organise and evaluate effective and efficient computer systems to enhance the functioning of hospitals, physician practices, integrated service delivery systems, managed care organisations and third party payers. Description**:** Introduction to the concepts and practices of health informatics. Topics include: a) major applications and commercial vendors; b) decision support methods and technologies; c) analysis, design, implementation, and evaluation of healthcare information systems; and d) new opportunities and emerging trends.

CSC934: Data Science (3 Units)
Students will learn how to explore new data sets, implement a HOURS comprehensive set of machine learning algorithms from scratch, and master all the components of a predictive model, such as data preprocessing, feature engineering, model selection, performance metrics and hyperparameter optimisation. Predictive Modelling: Regression, Classification, Data Preprocessing, Model Evaluation and Ensembles. Data Mining: Dimensionality Reduction, Clustering, Association Rules, Anomaly Detection, Network Analysis and Recommender Systems. Specialty Topics: Data Engineering, Natural Language Processing, and Web Applications.

CSC934: CyberSecurity (3 Units)
Introduction to cybersecurity: the evolution of cybersecurity, cybersecurity & situational awareness, the cybersecurity skills gap. Difference between Information Security & Cybersecurity: protecting digital assets. Cybersecurity objectives: confidentiality, integrity, & availability, Nonrepudiation. Cybersecurity roles: Governance, risk management, & compliance. What does a Cybersecurity professional do? , Information Security roles, Board of Directors, Executive management, Senior Information security management, Cybersecurity practitioners. Cybersecurity domains: Cybersecurity concepts, Security architecture principles, Security of networks, systems, applications, & data, Incident response, Security implications & adoption of evolving technology.

7.3.5.3 Ph.D. Courses

EDS911: ENTREPRENEURIAL DEVELOPMENT STUDIES VIX
Venture Starter Guide; Venture Creation; Innovate or Die; The Startup Way; Biblical Business Principles; The Business of your Talents and Skills; Entrepreneurial Leadership; Product Development; Deal-Making and Negotiation; Marketing and Selling; After 5pm: When True Work actually Begins; The Gig Economy

TMC911: Advanced Studies in Life Skills, Strategies and Principles II
Introduction; Man as a Tripartite Being (Body, Soul and Spirit); The Place of Preparation; Self-Discovery and the Making of a Total Man; Biographical Studies; Self-Management Strategies; Models of Leadership; Multiple Intelligence; Spirituality and Academic Excellence.

CSC941: Cluster and Grid Computing (3 Units)
Introduction To Distributed And High-Performance Computing. Basic Terms: Distributed Computing, Hpc, Hpcc, Network Computing, Internet Computing, Cluster, Grid, Meta-Computing, Middleware, Etc; Milestones Of The History, Some Representative Applications; Classification: Taxonomies, Mpp, Smp, Cc-Numa, Cluster: Dedicated High Performance (Hp), High Availability (Ha), Cops, Pops, Cows; Distributed, On-Demand, High-Throughput, Collaborative, Data-Intensive Computing; Basics Of Communication Media And Protocols: TCP/IP, Internet2, Qos, Atm, Fast Ethernet, Etc.; Programming Models: Message Passing, Client-Server, Peer-To-Peer, Broker Computing, Code Shipping, Proxy Computing, Mobile Agents. Toolkit And Oo Systems; Higher Level Communication: Light-Weight Communication, Sockets, Standard Apis, Active Messages; Storage And File Problems: Network Ram, Raid And Software Raid. Distributed File Systems: Nfs, Afs, Osf-Dsf, Rsf; Message Passing Standards: Pvm (Parallel Virtual Machine), Mpi (Message Passing Interface); Object-Oriented De Facto Standards Corba And Dcom; Java-Based Methods: Jvm, Rmi, Bytecode, Applet And Servlet, Javabean And Javaspaces, Jini; Grid Toolkit Approach: Globus Hourglass Concept, Communication, Resource And Process Management, Data Access, Security; Object-Oriented Approach: Legion Language Support, Component Wrapping, Programme Support, Resource Management; Security: Confidentiality, Integrity And Availability. Authentication, Authori-Zation, Assurance, Auditing, Accounting; Scheduling: Algorithms, Policies And Techniques, High Performance And High Throughput Schedulers, Resource Scheduling; Grid Monitoring: Tasks, Types, Architecture, Components.

CSC915: ICT and Research Methodology (3 Units)
Overview of research methodologies, sampling techniques, Introduction to informatics research, overview of empirical research methods, technical writing – conducting literature reviews, problem formulation and synthesis, ethics of ICT research.

CSC946: Data Mining and Warehousing (3 Units)
Data warehouse and OLAP Technology for Data Mining, Data Mining primitives, Languages and System Architecture, Concept Description, Mining association rules in large database classification and prediction problems, cluster analysis, Mining complex types of data, applications and trends in Data mining, Data mining algorithms: Apriori, hybrid apriori, COFI-tree, FP-tree, P-tree, Inverted matrix, Introduction to mining relation, Text, Sequence, Time-Series, web and Multimedia Data**.**

CSC947: Seminar 1 - Current Topics In Computing (3 Units)
A review of current work and theories in computing. Emphasis on latest work and theories in Software Engineering, Bioinformatics, Mobile Computing, Networking, Management Information System, Cloud

computing, Big data, Internet of things etc. Each student is expected to present a seminar on any chosen topic.

CSC948: Seminar2 - Technical Report Writing (3 Units)
Each student is expected to submit a bound hard copy of the content of the seminar that was presented in CSC947.

CSC944: Engineering of Intelligent Software Systems (3 Units)
Knowledge Engineering, Ontologies, Semantic Web Services, Applied Artificial Intelligence, Middleware Technologies, Evolutionary Computation, Neural Networks, Machine Learning, Software Agent Systems, Optimisation Techniques, Hybrid Intelligent Systems, Decision Support Systems (Fuzzy Logic and Fuzzy Expert Systems, CBR systems, Recommender Systems), Engineering of Internet Applications, Natural Language Processing & Applications, Human Computer Interaction , Automated Software Engineering, Automatic Verification, Intelligent Security Systems, Safety Critical Systems & Software Reliability, Formal Methods.

CSC943: Computational Molecular Biology (3 Units)
Basic concepts of molecular biology, importance of bioinformatics, pair-wise sequence alignment (Dynamic programming, heuristic methods and similarity matrices), multiple sequence alignment, BLAST, FASTA, Hidden Markov Model (Construction, application in alignment and gene prediction), phylogenetic tree, fragment assembly, physical mapping, combinatoric application in sequencing, sequence analysis and annotating, genomic rearrangements, computational gene finding. RNA secondary structure prediction, protein homology modelling, protein molecular dynamic, protein as initial structure prediction, integration of molecular biology data banks, experimentation biology support (sequence, structure prediction, DNA arrays), etc.

CSC952: Computation and Biostatistics (3 Units)
Formal languages, Chomsky hierarchy, formal computation and machine models, finite automation, pushdown automata, Turing machines, Church's Thesis, Recursively enumerable sets. Digonal arguments, Reducibility, complexity classes.
Definition, scope and applications. Presentation of data. Overview of measures of central tendency. Chi square test. Scientific writing I. (a) Biostatistics; Population and sample size. Sampling distribution. Research design. Study of some classical papers for experimental design and presentation of data. Normal, Binomial and Poisson distributions. Tests of significance. Students t test. Analysis of variance (ANOVA). One way and two way ANOVA. Regression Analysis. Simple and multiple regression. Overview of non-parametric tests. Statistical packages; Graphpad Instat, SAS, Epi Info, and SPSS, Markov Chain Monte Carlo, Introduction to Bayesian Statistics, Analysis of Molecular Variance, Growth Curves, Probit and Logit Models, Potency/efficacy determination.

HIT941: Knowledge Representation and Knowledge Management (3 Units)
Knowledge representation definition, The roles of knowledge representation. Knowledge elicitation, Operational definition of knowledge acquisition. Domain expert verse knowledge engineer.

HIT942: Emerging Trends in Health Information Systems (3 Units)
Telehealth, Stronger security, Chat Bots, Personalised medicine, Wearable technology.
Electronic Health Records, Mobile Access, Video Conference, Privacy and Security.

7.3.6 Staffing Requirements

Table 11: List of Academic Staff for Postgraduate Programme

S/N	NAME	ACADEMIC QUALIFICATION	PROFESSIONAL QUALIFICATION	DESIGNATION	AREA OF SPECIALISATION
1.	Prof. V. C. Osamor	B.Sc., PGD, M.Sc., Ph.D.	ASBCB, MTA, MNCS, MCPN	Professor / HOD	Computer Science/ Bioinformatics, Big Data, Artificial Intelliigence, Graphics
2.	Prof. C. K. Ayo	B.Sc., M.Sc., Ph.D.	MNCS, MCPN,MCP,CCNA	Professor	Computer Science/ MIS, eVoting Big data, Software Engineering
3.	Prof. E. F. Adebiyi	B.Sc., M.Sc., Ph.D.	MNCS, MCPN, ASBCB, ISCB, NISEB	Professor	Computer Science/ Bioinformatics
4.	Prof. A. A. Adebiyi	B.Sc., MBA, M.Sc., Ph.D.	MNCS, MCPN	Professor	MIS/ Artificial Intelligence
5.	Prof. A. A. Azeta	B.Sc., M.Sc., Ph.D.	MNCS, MCPN	Professor	Computer Science/ Software Engineering/Artificial Intelligence
6	Dr. O. J. Oyelade	B.Sc., M.Sc., Ph.D.	ASBCB, MNCS, MCPN	Associate Professor	Computer Science/ Bioinformatics
7.	Dr. (Mrs.) O. O. Oladipupo	B.Sc., M.Sc., Ph.D.	MNCS, MCPN	Associate Professor	Computer Science/ Artificial Intelligence
8	Dr. I. A. Odun-Ayo	B.Sc., M.Sc., Ph.D.		Senior Lecturer	Computer Science/ Cloud Computing
9	Dr. Mrs. M.O. Adebiyi	B.Sc., MSc, Ph.D.	ISCB, ASBCB, IEEE, MNCS	Senior Lecturer	Computerscience/ Bioinformatics
10.	Dr. I. T. Afolabi	B.Sc., M.Sc., Ph.D.	MNCS, MCPN	Senior Lecturer	Computer Science/ Text mining
11.	Dr. A. A. Oni	B.Sc., M.Sc., Ph.D.		Senior Lecturer	MIS/ Data Mining/ ICT Adoption
12	Dr. S. R. Okuboyejo	B.Sc., M.Sc., Ph.D.		Lecturer I	MIS/ Data Mining
13	Dr O. Iheanatu	B.Eng, M.Sc. Ph.D.		Lecturer II	MIS/ Text mining/ Artificial Intelligence
14	Dr. O. Emebo	B.Sc.,M.Sc., Ph.D.		Lecturer II	Computer Science/ Artificial Intelligence, Software Engineering
15	Dr. A. O. Adewumi	B.Sc. M.Sc., Ph.D.		Lecturer II	Computer Science/ Software Engineering
16	Dr I. Isewon	B.Sc. M.Sc., Ph.D.		Lecturer II	Computer Science/Bioinformatics

VISITING LECTURERS					
1.	Dr. P. A. Adewole	B.Sc., M.Sc., Ph.D.		Associate Professor	Computer Science/ Artificial Intelligence
ADJUNCT LECTURERS					
1.	Prof. Chinonye Moses	B.Sc., M.Sc., Ph.D.		Professor	EDS
2.	Dr. Tuesday Owoeye	B.A, M.A, Ph.D.		Senior Lecturer	TMC

7.3.7 Student Supervision Requirements

Table 12. Student Supervision Requirements

SN	Programme	To Teach	To Supervise	Main Supervisor	Co-Supervisor
1	Masters	Possess Ph.D. (LII-Professor)	Possess Ph.D. (LII-Professor)	N/A	N/A
2	Ph.D.	Possess Ph.D. (LI-Professor) - with minimum of 2 years experience	Possess Ph.D. (SL-Professor)	SL - Professor (With experience in Ph.D. supervision)	SL- Professor (With experience in Masters supervision)

Table 13: Classification of Grades

S/No.	Grade	Grade Level	CGPA	Classification	Status
1.	A	70.0 – 100	4.50 - 5.00	Distinction	Ph.D. Grade
2.	B	60.0 – 69.9	4.00 – 4.49	Credit	Ph.D. Grade
3.	C	55.0 – 56.9	3.50 – 3.99	Merit	M.Phil./Ph.D. Grade
4.	C-	50.0 – 54.9	3.00 – 3.49	Satisfactory	Terminal Masters
5.	F	0 – 49.9	0 – 2.99	Fail	Fail

7.4 INFORMATION AND COMMUNICATION ENGINEERING

7.4.1 Introduction

The Information and Communication Engineering programme is one of the three programmes established within the Department of Electrical and Information Engineering, which was founded in the 2004/2005 academic session under the College of Science and Technology in order to help provide the personnel needed to exploit the abundant natural resources and manpower for the growing industries of the nation. The department is presently under the College of Engineering. The Information and Communication Engineering programme offers three postgraduate degrees, namely, Master in Engineering (M.Eng.), Master of Philosophy (M.Phil./Ph.D.), and Doctor of Philosophy (Ph.D.).

The Information and Communication Engineering programme is offered in an intellectually and academically stimulating environment, taking pride in the collegial student-faculty relationship it provides and in its preparation of students for successful careers in industry, government and academia. Since

inception, the programme has graduated four (4) PGD, eight (8) M.Eng., and two (2) Ph.D. students till date. The programme underwent NUC resource verification in 2009 for postgraduate programmes and has since been providing advanced postgraduate education. The programme has a functional Postgraduate Committee comprising six (6) Professors, seven (7) Senior Lecturers, and three (3) faculty in the Lecturer I rank. As at the 2018/2019 academic session, a total number of five (5) M.Eng. and nineteen (19) Ph.D. students were enrolled in the Information and Communication Engineering postgraduate programme, with twenty-three PG faculty as teachers and supervisors.

Vision of the Programme

The Vision of the Programme is to produce total graduates empowered with the standards and practice of information and communication engineering, complemented with application-oriented courses that will advance their productive capacity to proffer solutions to national and international societal challenges.

Mission of the Programme

The Mission of the Programme is to prepare our students for leadership roles in the information and communication engineering profession by:

i. offering quality education that fosters a distinctive curriculum and accentuates design and project-based learning;
ii. committing to individual development while emphasising the values of teamwork in a culturally diverse and multidisciplinary environment;
iii. encouraging graduate research and nurturing creative solutions to complex engineering problems.
iv. creating universally-applicable and technologically-relevant knowledge, and, therefore, training and developing students who will be expert thinkers, intellectually resourceful, technologically relevant, and entrepreneurially self-dependent.

Philosophy of the Programme

The Philosophy of the Programme is to nurture postgraduate students by leveraging on sound foundational training and skills in information and communication engineering in order to become globally relevant in the industrial and academic domains. Information and communication engineering, as the backbone of the knowledge economy, is highly dynamic and versatile. Thus, the programme is also effectively committed to marrying theory with practicals so as to produce postgraduates who are producers rather than mere consumers in the knowledge economy, highly creative, innovative, and competent enough to be self-employed in the field of information and communication engineering, and her allied disciplines, or, in the least, be immediately employable.

Aim of the Postgraduate Programme

The Aim of the Programme is to provide students with the knowledge and skills necessary for a professional career or doctoral studies. This is done through course work, providing depth in one area of Specialisation and breadth in complementary areas. Areas of Specialisation range from artificial intelligence, mobile communication, IOT-enabled and smart operations, and signal processing.

Objectives of the Postgraduate Programme

The objectives of the postgraduate programmes are specifically to:

i. facilitate postgraduates with a good grasp of a broad spectrum of engineering principles and acquisition of practical work experience;
ii. inculcate entrepreneurial, marketing and management skills in the postgraduates and also engage them extensively in information and communication engineering research and development;

iii. train and produce postgraduates who will be alert to the engineering needs of their environment and be very willing and eager to meet these needs and will have the scientific and technical background for successful careers in diverse organisations;
iv. train and produce men and women who are equipped with all necessary tools (theoretical, spiritual, physical and intellectual) to design, build, install and maintain information and communication systems for the benefit of their environment and humankind in general.
v. provide postgraduate students with knowledge and competitive skills to enhance their performance and to enable them to assume broader responsibilities in the rapidly changing environment in the context of the global and contemporary knowledge economy;
vi. develop manpower that will be motivated and equipped to successfully pursue careers in a wide range of engineering fields, or in other fields, that would foster the attainment of the Vision 20:2020 and the Sustainable Development Goals; and
vii. bring up postgraduate students that will be able to work as leaders and effective communicators, both in the profession and in the community, and have a professional and ethical approach to their careers, with a strong awareness of the social contexts in which they work.

Degree Nomenclature

The Information and Communication Engineering programme offers postgraduate study by course work and research dissertation/thesis, leading to the award of the Master of Engineering (M.Eng.), Master of Philosophy (M.Phil./Ph.D.), or Doctor of Philosophy (Ph.D.) degrees as follows:

Information & Communication Engineering

- Master of Engineering (M.Eng.) in Information and Communication Engineering
- Master of Philosophy (M.Phil./Ph.D.) in Information and Communication Engineering
- Doctor of Philosophy (Ph.D.) in Information and Communication Engineering

7.4.2 Academic Content

The criteria for admission into the Information and Communication Engineering postgraduate programme are as stated below:

7.4.3 Admission Requirements

All candidates must have five Credit passes at O' level in Mathematics, English Language, Physics, Chemistry, and in any one of the following: Further Mathematics, Biology, Geography, or Technical Drawing, being the basic requirements.

7.4.3.1 Master of Engineering (M.Eng.) Information & Communication Engineering

i. Admission is open to candidates with a first degree in Electrical/Electronics or Communication Engineering (B.Sc./B.Eng. Electrical/Electronics or Communication Engineering), with a minimum of Second Class Lower Division from Covenant University, or any other university recognised by the Senate of Covenant University.
ii. Candidates with a third class degree in Electrical/Electronics or Communication Engineering from Covenant University or any recognised university will be deemed eligible if such candidates have obtained an additional PGD with a minimum CGPA of 3.50 in Electrical/Electronics or Communications Engineering from a recognised university.
iii. Candidates with at least a lower credit in Higher National Diploma (HND) from a recognised polytechnic and a PGD from an approved university, with a minimum CGPA of 3.50, may be considered for admission.

iv. In addition to the qualifications above, candidates shall be required to participate in a postgraduate screening exercise.

7.4.3.2 M.Phil./Ph.D. Information & Communication Engineering

i. Admission is open to applicants who possess an M.Eng./M.Sc. degree in Electrical/Electronics/Communication Engineering or its equivalent with CGPA of 3.50 - 3.99 from Covenant University or any other recognised university.
ii. Candidates with an M.Phil. degree, with a minimum CGPA of 3.50, in Electrical/Electronics/Communication Engineering from Covenant University or any other recognised university are eligible and can be considered for admission.
iii. In addition to the qualification requirements above, candidates shall be required to participate in a postgraduate screening exercise to qualify for admission.

7.4.3.3 Ph.D. Information & Communication Engineering

i. A candidate with academic Master's degree (M.Sc./M.Eng.) in **Electrical/Electronics (Communication option) or Communication Engineering**, with a minimum Cumulative Grade Point Average (CGPA) **of not less than** 4.00 on a 5-point scale or weighted average of 60% from Covenant University or any recognised university shall be eligible for admission to the Ph.D. **Information Communication Engineering** programme.
ii. A candidate who possesses an M.Phil., with a minimum CGPA of 4.00 on a 5-point scale or weighted average of 60%, in **Electrical/Electronics/ with Communication option or Communication Engineering** from Covenant University or any other recognised university is eligible for admission.
iii. In addition to the qualification requirements above, candidates shall be required to participate in a postgraduate screening exercise to qualify for admission.

7.4.4 Areas of Specialisation

The Information and Communication Engineering programme offers M.Eng., M.Phil./Ph.D., and Ph.D. degrees in Information and Communication Engineering.

7.4.5 Duration of Programme

7.4.5.1 Master's Degree Programme

i. Full-time: A minimum of three (3) semesters and a maximum of six (6) semesters
ii. Part-time: A minimum of four (4) semesters and a maximum of eight (8) semesters.

7.4.5.2 Master of Philosophy/Doctor of Philosophy (M.Phil./Ph.D.)

Full-time: The duration of the programme shall be two (2) semesters of coursework and two (2) years of doctoral research, provided that the candidates demonstrate the ability to transfer into the Ph.D. research phase. Each candidate will be required to submit a supervised research report at the end of the programme.

7.4.5.3 Ph.D. Information & Communication Engineering

A full-time Ph.D. Information and Communication Engineering degree programme shall last for a minimum of six (6) semesters and a maximum of eight (8) semesters. This includes one (1) semester of coursework and five (5) to seven (7) maximum semesters of research.

7.4.6 Graduation Requirements

The graduation requirements for the M.Eng., M.Phil./Ph.D., and Ph.D. degrees are presented below:

7.4.6.1 M.Eng. Requirements

A total of 45 units comprising 36 units of course work, 3 units of seminar and 6 units of research

7.4.6.2 M.Phil. /Ph.D. Requirements

A minimum of 50 units comprising 38 units of course work, six (6) units of seminar and six (6) units of research

7.4.6.3 Ph.D. Requirements

For the Ph.D. programmes, candidates shall be required to have taken the core/compulsory courses prescribed for the M.Eng. as prerequisites. This is in addition to the minimum 38 units which include research and seminars prescribed for the Ph.D.

able 1: Graduation Requirements

Level	Core Courses	University Courses	Elective Courses	Dissertation/Thesis	Total
M.Eng.	34	2	3	6	45
M.Phil./Ph.D.	18	2	24	12	50
Ph.D.	18	2	12	12	38

7.4.7 Examination Requirements

Course Work

a. For all postgraduate course work, the minimum pass score shall be 50%; continuous assessment shall constitute not less than 30% of the examination for each course.
b. Any student who fails in any course shall repeat such a course.
c. Any student whose Cumulative Grade Point Average (CGPA) falls below 2.50 at the end of two (2) consecutive semesters shall be required to withdraw from the programme.

The scoring and grading of courses shall be as follows:

Marks	Letter Grades	Grade Points
70 and above	A	5
60 -69	B	4
50 -59	C	3
0-49	F	0

7.4.8 Thesis or Dissertation

A panel of examiners shall be composed to orally assess a thesis or dissertation according to University regulations, but the examination shall, at least, be guided by the following:

a. Master's Thesis: The minimum composition of the examination panel shall comprise:
i. External Examiner;
ii. Head of Department;
iii. Supervisor;
iv. Co-supervisor (if any); or at least one other member of the Department (if no co-supervisor); and

v. One member appointed by the Postgraduate School.

Note that all master's degree programmes shall be subject to external examination and moderation.

b. Ph.D. Thesis: The minimum composition of the examination panel shall comprise:

i. External Examiner;
ii. Head of Department who must be a Ph.D. holder;
iii. Supervisor;
iv. Co-supervisor;
v. One other member of the Department who is not below the rank of a Senior Lecturer or an academic staff from a related department within the faculty who must be a Ph.D. holder; and
vi. A representative of the Board of the School of Postgraduate (PG) Studies.

7.4.9 Course Structure

The courses offered by M.Eng., M.Phil./Ph.D., and Ph.D. students in the Information and Communication Engineering programme are presented in Tables 2a - f respectively.

Table 2a: M.Eng. Programme Year 1 by Semesters

M. Eng. Information and Communication Engineering (1st Year)											
	ALPHA SEMESTER					OMEGA SEMESTER					
	Course Code	**Course Title**	**Status**	**Units**	**Prerequisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Prerequisite**	
Compulsory Courses	EIE810	Modern Control Theory	C	3		EIE821	Advanced Digital Signal Processing	C	3		
	EIE811	Software Systems for Modelling and Simulation	C	3		EIE822	Numerical Methods Using MATLAB	C	3		
	EIE812	Advanced Research and Development Techniques	C	3		EIE823	Project Management & Quality Assurance	C	2		
	ICE811	Advanced Digital Communications	C	3		EIE824	Laboratory Mini-Project	C	2		
	ICE812	Mobile & Personal Communications	C	3		EIE825	Seminar	C	3		

	ICE813	Network Security & Management	C	3							
	ICE814	Internet Engineering	C	3							
	Sub-Total			**21**		**Sub-Total**			**13**		**34**
Elective Courses						***Select 3 Credit Units from Electives***					
						ICE820	Microwave Communications	E	3		
						ICE821	Optical Communications	E	3		
						ICE822	Satellite Communication	E	3		
	Sub-Total					**Sub-Total**			**3**		**3**
University Courses	EDS811	Entrepreneurial Development Studies VIII	U	1							
	TMC811	Advanced Studies in Life Skills, Strategies and Principles I	U	1							
	CLD811	Certificate in Leadership Development	U	0							
	Sub-Total			**2**							**2**
	Total			**23**		***Total***			**16**		**39**

N.B.:

***C – Compulsory Courses**
***E – Elective Courses**

Table 2b: M.Eng. Year 2 by Semesters

M.Eng. Information and Communication Engineering (2nd Year)											
	ALPHA SEMESTER					OMEGA SEMESTER					
	Course Code	Course Title	Status	Units	Prerequisite	Course Code	Course Title		Units	Prerequisite	
Compulsory Courses	EIE829	Research/ Project Dissertation Begins				EIE829	Research/Project Dissertation Continues	C	6		
		TOTAL					**TOTAL**		6		**6**
										TOTAL	**45**

Table 2c: M.Phil./Ph.D. (Direct) Year 1 by Semesters

M. Phil./Ph.D. Information and Communication Engineering (1st Year)											
	ALPHA SEMESTER					OMEGA SEMESTER					
	Course Code	**Course Title**	**Status**	**Units**	**Prerequisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Prerequisite**	
Compulsory Courses	EIE911	Research Methodology	C	3		EIE924	Seminar I	C	3		
	EIE912	Advanced Digital Signal Processing	C	3		EIE925	Seminar II	C	3		
	Sub Total			**6**		**Sub Total**			**6**		**12**
Elective Courses	***Select 12 Credit Units Each from EIE Coded and ICE Coded Electives***										
						EIE921	Software Systems for Modelling and Simulation	E	3		
	EIE913	Machine Intelligence	E	3		EIE922	Computer-Based	E	3		

							Instrumentation Systems				
	EIE914	Transform Methods in Engineering Analysis	E	3		EIE923	Linear Multivariate Control Systems	E	3		
	ICE911	Advanced Topics in Network Security & Management	E	3		ICE921	Advanced Optical Communication	E	3		
	ICE912	Advanced Mobile Communications Networks	E	3		ICE922	Advanced Satellite Communication	E	3		
	ICE913	Advanced Telecommunication Software Development	E	3		ICE923	Advanced Internet Engineering	E	3		
	ICE914	Advanced Digital Communications	E	3		ICE924	Advanced Cryptology Principles & Applications	E	3		
	Sub-Total			**12**		**Sub-Total**			**12**		**24**
University Courses	EDS911	Entrepreneurial Development Studies IX	U	1							
	TMC911	Total Man Concept	U	1							
	CLD911	Certificate in Leadership Development	U	0							
	Sub-Total			**2**							**2**
	Total			**20**		***Total***			**18**		**38**

Table 2d: M.Phil./Ph.D. Years 2-4 by Semesters

M.Phil./Ph.D. Information and Communication Engineering											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory Courses	Course Code	Course Title	Status	Units	Prereq uisite	Course Code	Course Title	Status	Units	Prereq uisite	
						EIE926	College Proposal	C	3		
						EIE927	College Post-Field	C	3		
						EIE928	Oral Defence (Viva)	C	6		
		TOTAL					**TOTAL**		12		**12**
										TOTAL	**50**

Table 2e: Ph.D. (Direct) Year 1 by Semesters

Ph.D. Information and Communication Engineering (1st Year)											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory Courses	**Course Code**	**Course Title**	**Status**	**Units**	**Prereq uisite**	**Course Code**	**Course Title**	**Status**	**Units**	**Prereq uisite**	
	EIE911	Research Methodology	C	3		EIE924	Seminar 1	C	3		
	EIE912	Advanced Digital Signal Processing	C	3		EIE925	Seminar II	C	3		
	Sub Total			**6**		**Sub Total**			**6**		**12**
Elective Courses	***Select 6 Credit Units Each from EIE Coded and ICE Coded Electives***										
			E	3		EIE921	Software Systems for Modelling and Simulation	E	3		
	EIE913	Machine Intelligence	E	3		EIE922	Computer-Based	E	3		

							Instrumentation Systems				
	EIE914	Transform Methods in Engineering Analysis	E	3		EIE923	Linear Multivariate Control Systems	E	3		
	ICE911	Advanced Topics in Network Security & Management	E	3		ICE921	Advanced Optical Communication	E	3		
	ICE912	Advanced Mobile Communications Networks	E	3		ICE922	Advanced Satellite Communication	E	3		
	ICE913	Advanced Telecommunication Software Development	E	3		ICE923	Advanced Internet Engineering	E	3		
	ICE914	Advanced Digital Communications	E	3		ICE924	Advanced Cryptology Principles & Applications	E	3		
	Sub-Total			**6**		**Sub-Total**			**6**		**12**
University Courses	EDS911	Entrepreneurial Development Studies IX	U	1							
	TMC911	Total Man Concept	U	1							
	CLD911	Certificate in Leadership Development	U	0							
	Sub-Total			**2**							**2**
	Total			**14**		***Total***			**12**		**26**

Table 2f: Ph.D. (Direct) Years 2-3 by Semesters

Ph.D. Information and Communication Engineering											
	ALPHA SEMESTER					OMEGA SEMESTER					
Compulsory Courses	Course Code	Course Title	Status	Units	Prerequisite	Course Code	Course Title	Status	Units	Prerequisite	
						EIE926	College Proposal	C	3		
						EIE927	College Post-Field	C	3		
						EIE928	Oral Defence (Viva)	C	6		
		TOTAL					**TOTAL**		12		**12**
										TOTAL	**38**

7.4.10 Course Description

7.4.10.1 Information and Communication Engineering (M.Eng.)

EIE810: Modern Control Theory (3 Units)

The scope of this course covers: a revision of linear algebra in control theory – matrix operations, eigenvalues and eigenvectors; state space description and analysis of linear control systems – stability, observability, and controllability; pole-placement by state-feedback control; optimal control – linear quadratic regulator; state estimation; digital control system – Z-transforms, transfer functions, state space models, stability, root locus method, linear regulator design; fuzzy logic control – linguistic variables, fuzzy sets and operators, knowledge rules, system analysis, design and implementation, applications of fuzzy logic in control system; and neural network – introduction to mathematical analysis of neural network and learning rules, applications of neural network to control systems.

EIE811: Software Systems for Modelling and Simulation (3 Units)

This course is concerned with discrete, continuous and hybrid approaches to modelling and simulating natural and artificial systems. It also focuses on the use of MATLAB toolboxes.

EIE812: Advanced Research and Development Techniques (2 Units)

This course begins with an introduction which comprises the definition of research, characteristics of research, types of research, research process, research as a way of thinking, and application of research. Subsequently, the course contents include: IT Impacts – the 'automate' imperative and the 'informate' imperative in the emergence of a new research and development tool; the research proposal; the introduction; the problem; the objective of the study; the hypothesis to be tested; the study design; the setting; measurement procedures; sampling; analysis of data; and structure of the report.

The course also expands on the following: problems and limitations; work schedule; formulating a research problem – reviewing the literature, formulating a research problem, identifying variables, constructing hypothesis; conceptualising a research design – the research design, selecting a study design; constructing an instrument for data collection and sampling – selecting a method for data collection, establishing the validity and reliability of a research instrument, sampling, data collection, analysis, inference, and

presentation; data mining – models, tools, and applications; and writing a research report – research writing in general, referencing, writing a bibliography, developing an outline, and writing about a variable.
Further aspects of this course include: turning research findings to useful products; prototyping; intellectual-property issues – protecting the intangible; patents (What is eligible for a patent? How is a patent obtained? Employee/employer patent rights, using a patent, infringement, changes to watch for, patent searches over the Internet); copyrights (What is eligible for a copyright? How is a copyright obtained? Using a copyright, infringement, fair use of copyrighted material, changes to watch for, software piracy, plagiarism); trade secrets (What is eligible to be a trade secret? Using a trade secret, infringement); reverse engineering; the "look and feel" copyright controversy; software patents; and patent issues – writing a patent application.

EIE821: Advanced Digital Signal Processing (3 Units)
This course covers the following: a review of fundamentals of DSP – discrete-time signals and systems, sampling and reconstruction, Z-transform, transform analysis of linear time-invariant systems, structures for discrete-time systems, and Fourier analysis of signals using DFT, FFT; digital filters – digital and analogue filtering, filter specifications, magnitude and phase responses, IIR and FIR filters, design of IIR and FIR filters; rational parametric models of random signals; autoregressive models; Yule-Walker equations; Levinson-Durbin algorithm; lattice filters; Schur algorithm; adaptive FIR filters; error-performance surface; steepest-descent algorithm; LMS algorithm; convergence properties; gradient adaptive lattice filter; method of least squares; recursive least squares algorithm; applications in telecommunications; image processing; video compression; audio system; etc.; DSP hardware – fixed point and floating-point DSP, merits, demerits, and applications.
The course also explores FPGA architecture and data path design for digital filters, multirate filters, and spectrum channelisation using digital down converter. In addition, the course examines the implementation of FPGA DSP design using VHDL and visual dataflow methodologies.

EIE822: Numerical Methods Using MATLAB (3 Units)
The following are in the purview of this course: solution of nonlinear equations; solution of linear systems of the form Ax = b; interpolation and polynomial approximation; curve fitting; numerical differentiation; numerical integration solution of differential equations; solution of partial differential equations; eigenvalues and eigenvectors; review of matrix forms and operations; block matrix formulas; rank and linear dependence; conformable block operations; matrix inversion formulas; functions of square matrices; determinants and characteristics values and vectors; matrix trace and algebraic functions; similarity transformation and analytic functions; matrix norms; Cholesky decomposition and factoring algorithms; orthogonal decomposition of matrices: QR decomposition; singular values decomposition; eigenvalue-eigenvector decomposition of symmetric matrices; and quadratic forms.
Please, note that MATLAB is to be used extensively in exercises.

EIE823: Project Management & Quality Assurance (3 Units)
The contents of this course include: management concepts; project organisation; teams, methods and tools for project management; organisation constraints on development/system engineering, software development process, software life cycle, software metrics and measurement/project planning objectives, resources, project estimation, cost factors, decomposition techniques, estimation models, risk strategies, risk identification, risk projection, risk monitoring and management; work breakdown structure, task allocation/effort distribution; network diagrams, pert, and critical path method; Gantt Chart; scheduling strategies; project tracking; controlling progress, and quality measurement.

EIE824: Laboratory/Mini-Project (2 Units)

Students are expected to carry out a laboratory-based practical project aimed at contributing to the development of the laboratory resources of the department under the supervision of one or more academic staff of the department. A technical report shall be written and submitted as one of the requirements for passing this course.

EIE825: Seminar (3 units)

This course comprises an extensive review of twenty (20) scholarly publications (in a given area of research) from reputable outlets with at least 50% from ISI/SCOPUS-indexed outlets (e.g. Elsevier, IEEE, Science Direct, etc.). Each student is expected to produce and submit a report to the department, and the report should contain i) relevant state-of-the-art methodologies in the identified area of research; ii) identified current problems in the chosen research area; iii) a selection of the specific problem out of the list of identified problems the student will address. Each student will also make a presentation to the departmental postgraduate committee who will grade accordingly.

EIE829: Research/Project Dissertation (6 Units)

Students are to carry out a research project in electrical, electronics, software, or computer engineering involving design, experimental and/or computer simulation work as selected from topics supplied by faculty members or proposed by a student and approved by faculty. A dissertation is to be prepared according to specifications of the School of Postgraduate Studies.

ICE811: Advanced Digital Communications (3 Units)

The scope of this course covers the following: block diagram of digital communication system sampling theorem; Shannon theorem and applications in digital communication system; source coding; quantisation, signal representation; advantages of digital signals: noise in digital system; filtering and equalisation; digital modulation techniques – FSK, ASK, QPSK, M-PSK, QAM, etc.; error detection and correction techniques; encoders/decoders; probability of error; inter-symbol interference applications of digital communication system – satellite communication, telephoning microwave, wireless communication, optical communication, broadband; communication; and Internet technology.

ICE812: Mobile and Personal Communications (3 Units)

The following are included in the contents of this course: introductory concepts – overview of digital communication and radio communication characteristics, cellular concepts and frequency reuse, cellular geometry; co-channel interference and frequency planning; signal quality; traffic capacity and cell sizing; hand-offs and mobility management; cell splitting; other forms of wireless communication; signal impairments and countermeasures – path losses; multipath propagation; delay spread and ISI; fading characteristics; far-near and shadowing effects; adaptive detection for processing severely distorted signals; source and channel coding; diversity techniques; co-channel interference reduction techniques; directional antennas; sectored cells; adaptive antennas; cellular systems – multiple access techniques (FDMA, TDMA, CDMA, etc.); FDMA-based analogue cellular systems and standards (e.g. AMPS); introduction to digital cellular 20 standards and systems; design issues for FDMA/TDMA and FDMA/CDMA systems; speech coding and compression; channel coding; modulation; equalisation; frequency partitioning and planning.

This course also examines the following: network issues for cellular mobile communication – cellular network architectures; frequency management; channel types and assignment; types of hand-offs and hand-off management; switching and transport; wireline and microwave facilities and link design considerations; GSM standards and systems – GSM architecture, elements, and standard interfaces; FDMA/TDMA structure; speech and channel coding in GSM; time slots and bursts; signalling; hand-offs;

DCS 1800; GPRS; data services over GSM; TDMA, CDMA, and other systems and standards – digital AMPS (IS-136); CDMA (IS-95); CT2; PCN; CDPD; network architectures for IS-136 and IS-95; data services over TDMA and CDMA systems; third generation wireless standards – convergence; UMTS; IMT-2000; CDMA2000; W-CDMA; UWC-136; network layer standards; evolution of transport technologies – TDM; frame relay; ATM; IP; call processing and intelligent services over wireless networks; signalling; roaming and mobility management; route optimisation; Wireless Intelligent Networking (WIN); databases; protocols; security and billing issues; performance, traffic engineering, and network design; traffic engineering for air interface and transport networks; performance issues and analysis for voice quality, call set up and hand-offs; capacity planning; factors affecting economical network designs; and special topics – paging services and technologies, Short Message Services (SMS), wireless LANs and campus networks, Ad-hoc and infrastructure networks, intelligent cellular office networks.

ICE813: Network Security and Management (3 Units)

The focus of this course is provided below:

Network Security: security and open systems; typical security requirements; security policy; threats and safeguards; security services; intrusion detection and security audit; protocol layering; the OSI layer structures, services, and protocols; TCP/IP protocol suite; architectural placement of security services; management of security services; cryptographic techniques – private-key and public-key cryptosystems, seals and digital signatures, key management, distribution of keys, authentication, and access control; confidentiality and data integrity mechanisms; combining confidentiality and data integrity; security protocols – general security architectural concepts, transport layer security protocol, network layer security protocol, IEEE LAN security protocol, OSI upper layers architectural overview, upper layers security model, security exchanges; electronic mail and EDI security MHS (X.400) overview; security services; security protocol elements; security techniques; EDI security; and Internet privacy enhanced mail directory systems security.

Network Management: definition of a data network; role of network engineer; implementation of a data network; overview of network management; network management protocol; network management architecture; network management applications; fault management – fault management process, form of reporting fault; configuration management – configuration management process, accomplishing configuration management, generating configuration reports; performance management – performance management process, accomplishing performance management, reporting performance information; accounting management – accounting management process, accomplishing accounting management, reporting accounting information; network management protocols – SNMP, SNMPv2, CMIS/CMIP; network management tools – MIB tools, presentation tools, problem solving tools; telecommunication management network model and interface – operation system, mediation device, Q-Adapter, network element, distribution of TMN management functions, OSI functionality in TMN, standard interfaces between TMN components, Q3 interface, Qx interface; business management layer; service management layer; network management layer; element management layer; network element layer; integrating legacy equipment; standardised object-oriented programmatic interface; and tools to automate TMN-conformant application building.

ICE814: Internet Engineering (3 Units)

This course focuses on the following: Internet technology – evolution of the Internet; packet, frame and datagram; review of OSI layers; review of underlying network technologies – ethernet, token ring; internetworking concept and architectural model; Internet addresses; RFC (Request for Comments); Internet Architecture Board (IAB) and Internet Engineering Task Force (IETF); TCP/IP protocol suite –

IP, TCP, UDP, ARP, RARP, ICMP, routing protocols; Internet communications – client-server model of interaction; socket interface; bootstrap and auto configuration; Domain Name system (DNS); Internet multitasking; Mobile IP; private network interconnection (NAT, VPN); communication networks; narrowband ISDN – ISDN standards, interfaces and functions, ISDN services; frame relay and broadband ISDN – background, protocols and services; BISDN standards, services and architecture; SDH; ATM networks; cellular networks – overview, standards, network architecture; wireless LAN; modem technologies – xDSL, cable modem; IP over different networks and internetworking; Internet applications model; applications models; remote login (TELNET, Rlogin); file transfer and access (FTP, TFTP, NFS); electronic mail (SMTP, POP, IMAP, MIME); world wide web (HTTP); voice and video over IP (RTP); Internet management (SNMP); streaming technologies; WAP (Wireless Application Protocol); Internet security and electronic commerce technology – Internet security and firewall design (IPsec); encryption standards; electronic cash and transaction models; Internet business models and technology development.

ICE820: Microwave Communications (3 Units)

The concerns of this course include: microwave devices – overview of performance characteristics and applications; microwave diodes; microwave bipolar transistors; heterojunction bipolar transistors; field effect transistors; transferred electron devices; avalanche transit-time devices; microwave tubes; applications in microwave circuits; network analysis – transmission line equations and solutions, Smith chart, ABCD matrix, s-parameter matrix, signal flow graphs. impedance transformation and matching impedance measurements, single-stub matching, double-stub matching, triple-stub matching, impedance matching with lumped elements; waveguide reactive elements; quarter-wave transformer; binomial transformer; chebyshev transformer; tapered transmission lines waveguide and coaxial components – rectangular, bends and twists, ridge, fin line, terminations, attenuators, phase shifters, circular polarisers; coaxial-to-waveguide transitions; baluns; stripline circuits – substrate materials, stripline, microstrip, terminations, attenuators, couplers, power dividers, isolators, resonators, filters; power measurements – introduction, types of power measurements, sensors, meters, specifications, measurement uncertainty; spectrum analysis – basic theory, swept-tuned spectrum analyser, specifications, modulation, harmonic distortion, IP3, phase noise; filter response network measurements – scattering parameters, flow graph analysis, scalar network analyser, vector network analyser, specifications, VSWR bridge, calibration techniques, time-domain analysis, power sweep measurement, measurement examples; impedance measurements – parasitic elements, quality factor, circuit models, measurement techniques; noise figure measurements – introduction, types of noise, noise figure meter, noise generator, specifications, calibration and measurement methods; device and circuit characterisations – amplifier, oscillator, mixer, filter, setting of test limits.

ICE821: Optical Communications (3 Units)

The course contents are as follows: introduction – basic optical communications, generations, merits and limitations of optical fibre communications; optical fibre – geometry**,** wave propagation, dispersion, nonlinear effects, loss characteristics; optical receivers – block diagram, P-I-N and avalanche photodiode receivers, noise, sensitivity, bit error rate performance analysis, and design; coherent lightwave systems – principles of coherent and non-coherent detection; ASK, PSK, FSK, PPM, DPSK modulation formats; synchronous and asynchronous demodulation; bit error rate performance analysis; performance degradation due to laser phase noise, group velocity dispersion, self-phase modulation, polarisation mode dispersion, relative intensity noise, effect of timing jitter; system design considerations; optical amplifiers – basic principles, semiconductor optical amplifiers, doped fibre amplifiers, brillouin amplifiers, fibre raman amplifiers; amplifier noise; amplifier gain characteristics; amplifier performance analysis; system applications; multichannel lightwave systems – optical time division multiplexing (OTDM), optical frequency division multiplexing (OFDM), wavelength division multiplexing (WDM), optical code

division multiple-access (OCDMA), subcarrier multiplexing (SCM); WDM components – WDM multi/demultiplexers, add-and drop multiplexers (ADM), star couplers, optical cross-connects, wavelength converters; performance analysis of multi-channel systems; crosstalk; WDM systems; free space optical links – atmospheric optical channel, effects of atmosphere on optical beams, on direct detection receivers, heterodyning over atmospheric channel, optical intersatellite links; optical networks – topology, WDM networks; optical LAN, WAN; broadcast and select optical networks; wavelength routed optical networks; and future trends in optical fibre communications.

ICE822: Satellite Communications (3 Units)

The scope of this course includes the following: elements of satellite communications – satellite frequency bands, transmission and multiplexing schemes, trans-multiplexing, multiple access schemes; communication satellites – satellite orbit, laws governing satellite motion, satellite paths, geostationary satellites, non-geostationary constellations, satellite subsystems, launching of geostationary satellites; earth stations – earth station antennas (types of antennas, antenna gain, pointing loss, gain-noise temperature ratio, effective isotropic radiated power (EIRP)); high power amplifiers; low noise amplifiers; up and down converters – conversion process, polarisation hopping, redundancy configurations; earth station monitoring and control; satellite link design – basic link analysis, attenuation, sources of interference, carrier to noise and interference ratio, system availability, frequency reuse, link budget, link design; multiple access techniques – FDMA (compounded FDM-FM-FDMA, SSB-AM-FDMA), amplitude and phase nonlinearities, optimised carrier to noise and intermodulation ratio; TDMA – frame structure, burst structure, frame efficiency, super-frame structure, frame acquisition and synchronisation, satellite position determination, TDMA equipment, advanced TDMA satellite systems; CDMA – direct sequence CDMA (DS-CDMA), sequence synchronous and sequence asynchronous DS-CDMA, random access DS-CDMA, link analysis, frequency hop spread spectrum systems, frequency hop CDMA, acquisition and synchronisation; demand assignment multiple access (DAMA) – types of demand assignments, DAMA characteristics, real-time frame reconfiguration, DAMA interfaces, SCPC DAMA, SPADE, digital speech interpolation; satellite packet communications – message transmission by FDMA, M/G/1 queue; message transmission by TDMA – pure ALOHA-satellite packet switching, slotted ALOHA, packet reservation, tree algorithm; multibeam satellite networks – advantages and disadvantages of multibeam satellites, interconnection by transponder hopping, interconnection by on-board switching (SS/TDMA), interconnection by beam scanning, inter-satellite links (ISL) (GEO-LEO, GEO-GEO, LEOLEO, RF and optical links); very small aperture terminal (VSAT) networks – VSAT technologies, network configurations, multi-access and networking, network error control, polling VSAT networks; mobile satellite networks – MSAT network concept, statistics of mobile propagation; and land mobile satellite propagation – channel models, mobile satellite services, mobile satellite system parameters, network availability, network capacity, system design objectives, CDMA MSAT networks.

EDS811: Entrepreneurial Development Studies VIII (1 Unit)

This course covers the following topics: Introduction, Historical Background, Definition of Entrepreneurship/Entrepreneur, Theories, Types and Characteristics; Idea Generation, Opportunity Scouting and Exploitation; Environment of Entrepreneurship/Factors that Influence Successful Entrepreneurship; Entrepreneurs and Health Issues; The Concept of Intrapreneurship and Human Capital; Capital Knowledge, ICT, and Entrepreneurship; Creativity, Innovation and Sustainable Entrepreneurship; Wealth Creation and Waste Recycling Process; Marketing and Entrepreneurial Marketing; Financing SMEs in Nigeria— A Review of Formal and Informal Financing; Characteristics, Policy/Theoretical Framework and Challenges of Women Entrepreneurship; Social Evidence of Entrepreneurship and Ethics; Academic Entrepreneurship, Intellectual Property and R&D; and Feasibility Report and Business Plan.

TMC811: Advanced Studies in Life Skills, Strategies and Principles I (1 Unit)
The topics in this course include: Introduction; Man as a Tripartite Being (Body, Soul and Spirit); Self-Discovery and the Making of a Total Man; Integrity and Character Development; Biographical Studies; Introduction to Leadership Development; Christian Work Ethics; Vision Building; and Leadership Virtues and Dispositions.

7.4.10.2 Information and Communication Engineering Option (M.Phil./Ph.D. and Ph.D.)

EIE911: Advanced Research and Development Techniques (3 Units)
This course begins with an introduction which comprises the definition of research, characteristics of research, types of research, research process, research as a way of thinking, and application of research. Subsequently, the course contents include: IT Impacts – the 'automate' imperative and the 'informate' imperative in the emergence of a new research and development tool; the research proposal; the introduction; the problem; the objective of the study; the hypothesis to be tested; the study design; the setting; measurement procedures; sampling; analysis of data; and structure of the report.
The course also expands on the following: problems and limitations; work schedule; formulating a research problem – reviewing the literature, formulating a research problem, identifying variables, constructing hypothesis; conceptualising a research design – the research design, selecting a study design; constructing an instrument for data collection and sampling – selecting a method for data collection, establishing the validity and reliability of a research instrument, sampling, data collection, analysis, inference, and presentation; data mining – models, tools, and applications; and writing a research report – research writing in general, referencing, writing a bibliography, developing an outline, and writing about a variable.
Further aspects of this course include: turning research findings to useful products; prototyping; intellectual-property issues – protecting the intangible; patents (What is eligible for a patent? How is a patent obtained? Employee/employer patent rights, using a patent, infringement, changes to watch for, patent searches over the Internet); copyrights (What is eligible for a copyright? How is a copyright obtained? Using a copyright, infringement, fair use of copyrighted material, changes to watch for, software piracy, plagiarism); trade secrets (What is eligible to be a trade secret? Using a trade secret, infringement); reverse engineering; the "look and feel" copyright controversy; software patents; and patent issues – writing a patent application.

EIE912: Advanced Digital Signal Processing (3 Units)
This course covers the following: a review of fundamentals of DSP – discrete-time signals and systems, sampling and reconstruction, Z-transform, transform analysis of linear time-invariant systems, structures for discrete -time systems, and Fourier analysis of signals using DFT, FFT; digital filters – digital and analogue filtering, filter specifications, magnitude and phase responses, IIR and FIR filters, design of IIR and FIR filters; rational parametric models of random signals; autoregressive models; Yule-Walker equations; Levinson-Durbin algorithm; lattice filters; Schur algorithm; adaptive FIR filters; error-performance surface; steepest-descent algorithm; LMS algorithm; convergence properties; gradient adaptive lattice filter; method of least squares; recursive least squares algorithm; applications in telecommunications; image processing; video compression; audio system; etc.; DSP hardware – fixed point and floating-point DSP, merits, demerits, and applications.

EIE913: Machine intelligence (3 Units)
The contents of this course span: an introduction to artificial intelligence; engineering applications of artificial intelligence (AI) – problem-solving techniques, knowledge acquisition, knowledge representation, production systems, expert systems, AI languages, neural networks, and machine learning; design projects required; neural network – definition of artificial neural network; similarities between

neural network and the human brain; classification of ANN; terminologies – input/output sets, weights, bias or threshold, supervised learning, network training, convergence process, single layer vs. multilayer perception, forward and backward propagation, gradient descent rule; back-propagation neural network; variable terms used in back propagation neural network – learning rate, momentum, hidden nodes, sigmoid activation function; back propagation algorithm of ANN; design of ANN model; training sets for ANN; test sets for ANN; network testing and performance; engineering applications; and ANN programming.

EIE914: Transform Methods in Engineering Analysis (3 Units)
This course focuses on Laplace transforms and applications; Z-transforms and applications; Fourier transforms – DFT and FFT; and other transforms. It also explores the use of the MATLAB signal processing toolbox.

EIE924: Seminar I (3 units)
Students undertake an extensive review of sixty (60) scholarly publications (in a given area of research) from reputable outlets, with at least 50% from ISI/SCOPUS-indexed outlets (e.g. Elsevier, IEEE, ScienceDirect, etc.). Each student is expected to produce and submit a report to the department, and the report should contain i) relevant state-of-the-art methodologies in the identified area of research; ii) current problems in the research area; iii) a specific problem statement that a further research work will address, as justified from identified domain-specific problems. Each student will also make a presentation to the departmental postgraduate committee, and be graded accordingly.

EIE925: Seminar II (3 units)
This is a continuation of Seminar I, and a proper report will also be prepared and submitted to the department. This report should highlight a further research aim and objectives, with the identified problem statement (in Seminar I) broken down into a number of specific tasks. The methodology, resources/facilities suitable for the further research work should be described.

EIE921: Software Systems for Modelling and Simulation (3 Units)
This course is concerned with discrete, continuous and hybrid approaches to modelling and simulating natural and artificial systems. It also focuses on the use of MATLAB toolboxes.

EIE922: Computer-Based Instrumentation (3 Units)
The scope of this course covers the theory and practice of electronic instrumentation; computer-based data acquisition and control techniques; and intelligent instruments.

EIE923: Linear Multivariable Control Systems (3 Units)
This course involves the following: state space analysis of continuous and discrete multivariable plants; controllability and observability; control signal interactions in multivariable plants; controller design techniques – non-interacting controller, pre-compensator design, and decoupling by state feedback; and stability of linear and non-linear plants.

EIE926: College Proposal (3 Units)
Each student makes a short presentation before the college postgraduate board, outlining a proposed research topic, based on relevant academic theories, research hypothesis and experimental methods.

EIE927: College Post-Field (3 Units)
Each student makes a short presentation of research data, method of analysis, and proposed conclusions before the college postgraduate board.

EIE928: Oral Defence (Viva) (6 Units)
This is the defence of thesis before the external examiner, with representatives from the college and departmental postgraduate board.

ICE911: Network Security & Management (3 Units)
The scope of this course covers network security; cryptographic techniques; security protocols; general security architectural concepts; transport layer security protocol; network layer security protocol; IEEE LAN security protocol; OSI upper layers architectural overview; upper layers security model; security exchanges; directory systems security network management; fault management; performance management process; accomplishing performance management; reporting performance information; accounting management; and network management protocols.

ICE912: Mobile & Personal Communications (3 Units)
The contents of this course cover: introductory concepts – overview of digital communication and radio communication characteristics; cellular concepts and frequency reuse; cellular geometry; co-channel interference and frequency planning; signal quality, traffic capacity and cell sizing; hand-offs and mobility management; cell splitting; other forms of wireless communication; signal impairments and countermeasures – path losses, multipath propagation, delay spread and ISI; fading characteristics; far-near and shadowing effects; adaptive detection for processing severely distorted signals; source and channel coding; diversity techniques; co-channel interference reduction techniques; directional antennas; sectored cells; adaptive antennas; and cellular systems.

ICE913: Telecommunication Software Development (3 Units)
The main focus of this course is on telecommunication software development. The contents include an introduction which explores examples of life cycles (V life cycle, Y life cycle, spiral life cycle, etc.). The course then explains methods and tools for requirement capture, analysis, specification, architecture, design and development. It examines finite state machines – the SDL language. Additional aspects of the course include: programming – an overview of programming languages (C, C++, Java) in telecommunication, real-time programming, programming for embedded systems; performance and memory management; configuration management: interfaces definition – problem overview; transparency of distribution; distributed 00 – the COREA solution, the Java solution; interface specification in TMN; system tests – unit tests; software integration tests; hardware integration tests; embedded software tests: performance and conformance tests: testing of 00 software: and CASE to test – Attols, Insure, Hindsight, etc.

ICE914: Advanced Digital Communications (3 Units)
The scope of this course covers the following: block diagram of digital communication system sampling theorem; Shannon theorem and applications in digital communication system; source coding; quantisation, signal representation; advantages of digital signals: noise in digital system; filtering and equalisation; digital modulation techniques – FSK, ASK, QPSK, M-PSK, QAM, etc.; error detection and correction techniques; encoders/decoders; probability of error; inter-symbol interference applications of digital communication system – satellite communication, telephoning microwave, wireless communication, optical communication, broadband; communication; and Internet technology.

ICE921: Advanced Optical Communications (3 Units)

The contents of this course are as follows: introduction – basic optical communications, generations, merits and limitations of optical fibre communications; optical fibre – geometry, wave propagation, dispersion, nonlinear effects, loss characteristics; optical receivers – block diagram, P-I-N and avalanche photodiode receivers, noise, sensitivity, bit error rate performance analysis, and design; coherent light wave systems – principles of coherent and non-coherent detection; ASK, PSK, FSK, PPM, DPSK modulation formats; synchronous and asynchronous demodulation; bit error rate performance analysis; performance degradation due to laser phase noise, group velocity dispersion, self-phase modulation, polarisation mode dispersion, relative intensity noise, effect of timing jitter; doped fibre amplifiers, brillouin amplifiers, fibre raman amplifiers; amplifier noise; amplifier gain characteristics; amplifier performance analysis; and optical time division multiplexing (OTDM).

ICE922: Advanced Satellite Communications (3 Units)

The scope of this course covers: elements of satellite communications – satellite frequency bands, transmission and multiplexing schemes, trans-multiplexing, multiple access schemes; communication satellites – satellite orbit, laws governing satellite motion, satellite paths, geostationary satellites, non-geostationary constellations, satellite subsystems, launching of geostationary satellites; earth stations – earth station antennas (types of antennas, antenna gain, pointing loss, gain-noise temperature ratio, effective isotropic radiated power (EIRP)); high power amplifiers; low noise amplifiers; up and down converters – conversion process, polarisation hopping, redundancy configurations; earth station monitoring and control; satellite link design – basic link analysis, attenuation, sources of interference, carrier to noise and interference ratio, system availability, frequency reuse, link budget, link design; and multiple access techniques – FDMA.

ICE923: Advanced Internet Engineering (3 Units)

The course begins with a description of internet technology. It then focuses on the following: communication networks – narrowband ISDN (ISDN standards, interfaces and functions); ISDN services; frame relay and broadband ISDN – background, protocols and services, B-ISDN standards, services and architecture, SOH; ATM networks; cellular networks – overview, standards, network architecture (OFDM), wavelength division multiplexing (WDM), optical code division multiple-access (OCDMA), subcarrier multiplexing (SCM); WDM components – WDM multi/demultiplexers, add and drop multiplexers (ADM), star couplers, optical cross-connects, wavelength converters; performance analysis of multi-channel systems; crosstalk; WDM systems; free space optical links – atmospheric optical channel, effects of atmosphere on optical beams, on direct detection receivers, heterodyning over atmospheric channel, optical inter satellite links; optical networks – topology, WDM networks, optical LAN, WAN; broadcast and select optical networks; wavelength routed optical networks; and future trends in optical fibre communications.

ICE924: Advanced Cryptography Principles and Applications (3 Units)

The contents of this course include the following: history of cryptographic systems; public key systems; digital signatures; information theory – entropy, perfect secrecy, unicity distance, complexity theory, NP completeness, and number theory; data encryption methods – transposition ciphers, substitution ciphers, product ciphers, exponentiation ciphers, knapsack ciphers, breakable NP-complete knapsack, encryption standards DES, RSA, and elliptic curves; cryptographic techniques – block and stream ciphers, autokey, endpoints of encryption, one-way ciphers, password and authentication, secret keys and public keys, threshold scheme; video scrambling techniques; digital video encryption techniques – principle, IRDETO,

viaaccess, videoguard, etc.; security and legality issues – copyrights, patents, trade secret, ownership of products, computer crimes; and ethical issues in computer security.

EDS911: Entrepreneurial Development Studies VIX (1 Unit)
The topics in this course are: Venture Starter Guide; Venture Creation; Innovate or Die; The Start-Up Way; Biblical Business Principles; The Business of Your Talents and Skills; Entrepreneurial Leadership; Product Development; Deal-Making and Negotiation; Marketing and Selling; After 5pm: When True Work Actually Begins; and The Gig Economy.

TMC911: Advanced Studies in Life Skills, Strategies and Principles II (1 Unit)
The topics in this course include: Introduction; Man as a Tripartite Being (Body, Soul and Spirit); Self-Discovery and the Making of a Total Man; Integrity and Character Development; Biographical Studies; Introduction to Leadership Development; Christian Work Ethics; Vision Building; and Leadership Virtues and Dispositions.

7.4.11 Staffing Requirements

Teachers of postgraduate courses, should be holders of a Ph.D. degree, provided that those who teach Ph.D. courses are of the rank of at least Lecturer I.

Table 3a: List of Academic Staff for the Postgraduate Programme

S/N	NAME	ACADEMIC QUALIFICATION	PROFESSIONAL QUALIFICATION	DESIGNATION	AREA OF SPECIALISATION
1.	Prof. A.U. Adoghe	B.Eng., M.Eng., Ph.D.	MNSE, MIEEE R. Engr., COREN	Professor/HOD	Power System Reliability, Renewable Energy; Power System Operation, High Voltage and Machine and Electrical Power Components Maintenance and Optimisation
2.	Prof. AAA Atayero	B.Sc., M.Sc., Ph.D.	MNSE, MIEEE R. Engr., COREN	Professor/VC	Broadband Wireless Access, IoT-Enabled Applications for Smart & Connected Communities and IoT-Enabled Cyber-Physical Systems for Smart & Connected

S/N	NAME	ACADEMIC QUALIFICATION	PROFESSIONAL QUALIFICATION	DESIGNATION	AREA OF SPECIALISATION
					Communities (SCC)
3.	Prof. COA Awosope	B.Eng., M.Eng., Ph.D.	MNSE, R. Engr., COREN	Professor	Power System Reliability, Machine, High Voltage and Control Engineering
4.	Prof. Sanjay Misra	B.Sc., M.Sc., Ph.D.	SMIEEE	Professor	Information Engineering, Software Engineering, Web Engineering, Software Quality Assurance, Software Process Improvement, Software Project Management, Object-Oriented Technologies
5.	Prof. Francis E. Idachaba	B.Eng., M.Eng., Ph.D.	MNSE, R. Engr., COREN	Professor	Communication Engineering
6	Prof. E. A. Adetiba	B.Eng., M.Eng., Ph.D.	MIEEE, MNSE, R.Engr. COREN	Professor	Machine Intelligence, Software-Defined and Cognitive Radio, Biomedical Signal Processing
7.	Dr. A. F. Agbetuyi	B.Eng., M.Eng., Ph.D.	MIEEE, MNSE, R.Engr. COREN	Senior Lecturer	Power System Stability, Renewable Energy and Integration, Power System Protection
8	Dr. Hope E. Orovwode	B.Eng, M.Eng., Ph.D.	MIEEE, MNSE, R.Engr. COREN	Senior Lecturer	Power Electronics, ICT Application to

S/N	NAME	ACADEMIC QUALIFICATION	PROFESSIONAL QUALIFICATION	DESIGNATION	AREA OF SPECIALISATION
					Electrical Power Management and Optimisation
9	Dr. Abdulkareem Ademola	B.Eng., M.Eng., Ph.D.	MIEEE, MNSE, R.Engr. COREN	Senior Lecturer	Electrical Power Systems; Renewable Energy Integration, Power System Security and Reliability, Power System Investment Planning, Electric Energy Industry Restructuring and High Voltage Cable and Machines
10.	Dr. A.A. Awelewa	B.Eng., M.Eng., Ph.D.	MIEEE, MNSE, R.Engr. COREN	Senior Lecturer	Modelling, Analysis, and Control of Dynamical Systems; and Stabilisation and Control of Electric Power Networks
11.	Dr. I. A. Samuel	B.Eng., M.Eng., Ph.D.	MIEEE, MNSE, R.Engr. COREN	Senior Lecturer	Design of AC generators for Electrical Power Systems; Small Hydro Power Systems and Wind Turbines
12	Dr. A. A. Adewale	B.Sc., M.Sc., Ph.D.	MNSE, R.Engr. COREN	Senior Lecturer	Computer Networking, Data Communication, Network Security and Software Engineering
13	Dr. J.A. Badejo	B.Eng., M.Eng., Ph.D.	MNSE, R.Engr. COREN	Senior Lecturer	Biometrics & Biomedical Image Analysis, Machine Learning, Data Analytics, Software Engineering

S/N	NAME	ACADEMIC QUALIFICATION	PROFESSIONAL QUALIFICATION	DESIGNATION	AREA OF SPECIALISATION
14	Dr. J.O. Olowoleni	B.Eng., M.Eng., Ph.D.	MNSE, R.Engr. COREN	Lecturer I	Power Systems and Electrical Machines
15	Dr. H. K. Anabi	B.Eng., M.Eng., Ph.D.	MIEEE	Lecturer II	Wireless Communication and Programming
16	Dr. Victoria Oguntosin	B.Eng., M.Eng., Ph.D.	MIET	Lecturer II	Software Robotics and Control

Table 3b: Adjunct Lecturers

S/N	NAME	AREA OF SPECIALISATION	QUALIFICATION	DESIGNATION	COURSE(S) TAUGHT
1	Prof. Chinonye Moses	Strategic Management and Entrepreneurship	B.Sc., MBA, M.Sc., Ph.D.	Professor	Entrepreneurial Development Studies (EDS)
2	Dr. Tuesday Owoeye	Languages	B.A., M.A., Ph.D.	Senior Lecturer	Total Man Concept (TMC)

Table 3c: Visiting Lecturers

S/N	NAME	AREA OF SPECIALISATION	QUALIFICATION	DESIGNATION	COURSE(S) TAUGHT
1	Prof. Deji Akinwande	Electrical Engineering and Applied Physics	B.Eng., M.Eng., Ph.D.	Professor	Postgraduate Supervision
2	Prof. Samuel N. John	Network Communication	B.Sc., M.Sc., Ph.D.	Professor	Advanced Computer Security and Networking (ICE923)
3	Dr. O. O. Olusanya	Mobile Computing, System Modelling and Simulation, Embedded System Design, Data Engineering	B.Tech., M.Eng., Ph.D.	Senior Lecturer	Numerical Methods using MATLAB (EIE822)
4	Dr. F. M. Dahunsi	Computer and Communication Engineering, Control and Computer Engineering and	B.Eng., M.Eng., Ph.D.	Senior Lecturer	Modern Control Engineering (EIE810)

		Software System Design and Implementation			

7.4.12 Requirements for Student Supervision

The requirements for supervision of postgraduate students shall be as follows:

a. At least one (1) supervisor for each postgraduate student on the master's and at least two (2) for the Ph.D. programme shall be appointed.
b. All lecturers qualified to teach postgraduate courses and who are not registered postgraduate students shall be eligible to supervise master's programmes. Ph.D. supervisors must be of a rank not lower than Senior Lecturer.
c. A supervisor shall guide a student in his/her studies and the department shall keep a record of the candidate's progress and submit a regular progress report through the Dean to the Board of Postgraduate Studies.
d. A supervisor may be changed where and when necessary, subject to the approval of the Board of Postgraduate Studies.
e. Where a student does part or all his required courses in another institution, the external supervisor shall only be required to submit a written report on the candidate at the end of the programme. Such supervisor shall not normally be required to participate in the oral examination of the candidate.