COVENANT UNIVERSITY

ACADEMIC HANDBOOK
(UNDERGRADUATE)

COLLEGE OF ENGINEERING (CoE)

2014 – 2017

COVENANT UNIVERSITY

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TABLE OF CONTENTS

Chapter Four: Colleges, Schools and Departments

CHANCELLOR AND CHAIRMAN, BOARD OF REGENTS

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Chancellor and Chairman, Board of Regents
Covenant University

WELCOME MESSAGE FROM THE CHANCELLOR

Raising A New Generation Of Leaders

"Seest thou a man diligent in his business? he shall stand before kings; he shall not stand before mean men". (Proverbs 22:29 - KJV)

Covenant University is a Royal Academy birthed on the platform of a compelling vision to raise a new generation of leaders, especially for the Continent of Africa. It is indeed the birth place of "kings and queens". I do believe that the greatest need of the 21st Century is that of Leadership, whereas leadership is not an endowment, it is a commitment to the future that makes a leader.

Our mission at Covenant University is to develop the man who will in turn develop his world. We see character as the anchor of leadership. Ability makes a manager but integrity makes a leader.

Our experience over the last twelve years strongly indicates the great potential we have as a University in instituting a world class learning context that is rich in educational opportunities, research and scholarship. The heart-warming positive feedback from employers on the excellent and exemplary conducts of our graduates is indeed, one of the many concrete validations of the University's unique vision. We are however, looking ahead to the future we envision in driving excellence across all our programmes by ensuring that the stage is well anchored to actualize our set vision of raising a new generation of leaders.

Only a serious approach guarantees a glorious result. There is no short cut to any place worth going. Edmund Hilary, the first man that conquered Mount Everest, said, "It is not the mountain that we conquered but ourselves". Covenant University is indeed a place where you are taught how to conquer yourself as part of the process of becoming outstanding in life. Therefore, if leadership and excellence are your goals, then Covenant University is the right place for you.

Starting from the 2013/2014 Academic Session, every student of the University shall be made to undertake at least a Certificate/Diploma Course in Leadership in addition to his/her major discipline.

Therefore, the currency of the curriculum and the inclusion of Leadership Certificate will be one of the unique selling points.

You are welcome to Covenant University, a Royal Academy, a Leadership Training Varsity.

Dr. David O. Oyedepo
Chancellor, Covenant University

FROM THE VICE-CHANCELLOR'S DESK

On assumption of Office as the third substantive Vice-Chancellor of Covenant University, coming up immediately after the 10th Anniversary of the University, my team was given the mandate to get the University listed as one of the best ten Universities in the world within the next ten years. This mandate is presented as Vision 10:1022 and christened (1 of 10 in 10).

The mandate is a very ambitious one, but looking through the accomplishments of the University within the first ten years of existence, the various awards and laurels, the radical changes brought on board, the curricula of the University system in terms of Entrepreneurial Development Studies, Information and Communication Engineering amongst others, we are convinced beyond reasonable doubt that the feat is attainable. Using the testimony of David when he confronted Goliath, he said: "Your servant slew both the lion and the bear; and this uncircumcised Philistine shall be as one of them, ..." (I Sam, 17:36 KJV). By God's Grace, this vision shall be actualized.

In order to successfully accomplish this feat, Management instituted a number of measures, which include: Review of curricula, improved research products and collaboration, improved scholarly publications in recognized outlets, improved teaching facilities, improved teaching and learning envir onment to attract international faculty and students as well as internationalization of our operations.

The revised curricula are aimed at improving global relevance, employability of our graduates as well as making them major contributors to the fulfillment of Vision 10:2022 and the Millennium Development Goals (MDGs).

What a privilege to have this crop of students benefit from this revised edition.

Congratulations! Vision 10:2022 (1 of 10 in 10) - A Prophetic Verdict.

Professor Charles K. Ayo
Vice-Chancellor, Covenant University

Covenant University Gate

Covenant University Centre for Learning Resources

Senate Building

CHAPTER ONE

INTRODUCTION

1.0 THE NAME: COVENANT UNIVERSITY (CU)

All over Africa, and Nigeria in particular, a great significance is attached to names. They portray meanings and convey important messages. Names reflect circumstances of birth or events. The word "Covenant" was chosen as an expression of the University's total commitment and vow to make a Total Man of her students. It reflects the intention of the proprietors of the University to uphold a binding agreement with students to deliver their desires for excellence and career exploits by offering them the best in educational attainment and by offering their parents/guardians the best value for their investment. It is also common knowledge that every covenant is ratified by blood and, as a church-sponsored University, we consider the blood of Jesus Christ, which is the blood of the everlasting covenant, as our stronghold in the fulfilment of this awesome obligation. Covenant University vows to make of her graduates expert thinkers, leader-managers, and hyper-resourceful technocrats in all fields of human endeavour.

1.1 OUR VISION

To be a leading World-Class University, committed to raising a new generation of leaders in all fields of human endeavour.

1.2 OUR MISSION

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.

Application of research that promotes integrated, life-transforming values through Science, Technology and Human Capacity Building.

On October 21, 2002, the African educational landscape was radically altered by the formal entry of Covenant University (CU) into the Higher

Education context. The University is located at Canaanland, Ota, Ogun State, Nigeria. The University is a growing,
dynamic vision-birthed and vision-driven University, founded on a Christian mission ethos and committed to pioneering excellence at the cutting edge of learning.

The University's specific mandate can be stated as follows:

"Raising a new generation of leaders through a qualitative and life-applicable training system that focuses on value and skill development".
"Raising a new generation of leaders through a broad-based qualitative education built on sound biblical principles culminating in the birth of path-finders, pace-setters and trail-blazers".

"Raising a new generation of leaders who shall redeem the battered image of the black race and restore her lost glory as this trained army of reformers begins to build the old wastes, repair the wasted cities and raise the desolation of many generations".

1.3 OUR FOUNDING PHILOSOPHY

In response to the global demand for a departure from dogmatism to dynamism in the existing educational system, Covenant University is built on the following philosophical platform:

- a departure from form to skill
- a departure from knowledge to empowerment
- a departure from figures to future-building
- a departure from legalism to realism
- a departure from mathe-matics to life-matics.

This is reflected in our motto: "Raising a New Generation of Leaders".

1.4 OUR OBJECTIVES

The objectives of the University are to:

i. provide facilities for learning and give instructions and training in such areas of knowledge that will produce sound and mentally equipped graduates, who will provide intellectual leadership in academic institutions, industry and the public sector through the Total Man Concept approach;

ii. develop and offer academic and professional programmes leading to the award of diplomas, first degrees and higher degrees, which emphasize planning, adaptive and technological maintenance, developmental and productive skills;

iii. promote by research and other means, the advancement of knowledge and its practical application to social, cultural, economic, scientific and technological problems;

iv. encourage and promote scholarship and conduct research in all fields of learning and human endeavour;

v. disseminate scientific and technological knowledge among scientists, researchers, industries, trade services and other bodies; and

vi. relate its activities to the technological, scientific and socio-economic needs of the people of Nigeria and to undertake other activities appropriate for a University of the highest standard.

1.5 OUR CORE VALUES

Our Core Values as a University are the defining components of the Covenant University Vision and they reflect our beliefs in the encrypted truths that firmly define our purpose and the underlining ethos of our existence as a University.

As a University, we strongly uphold the practices embedded in our Core Values and strive to integrate these Values into all facets of our functions and operations as a University. We expect that students of Covenant University will visibly demonstrate and integrate the virtues embedded in these Core Values in their daily conduct as students who are being raised along the Vision lines of raising a New Generation of Leaders for the Continent of Africa on the Total Man Concept-driven developmental platform. All students are expected to adhere strictly to the University's Core Values in their day-to-day activities within or outside the University.

The Covenant University Core Values are: Spirituality, Possibility Mentality, Capacity Building, Integrity, Responsibility, Diligence and Sacrifice.

Spirituality

This forms the bedrock of our existence as a University and defines every aspect of our operations and context. The Christian ethos underlies our activities and conducts at all times, and every student of Covenant University is expected to exhibit the character traits and dispositions of a Jesus-centred heritage. The Jesus - factor centred approach to all issues is non-negotiable and central in the pursuit of our mandate in raising a New Generation of leaders. To this end, therefore, students are to be committed to maintaining a high level of spirituality and act in such a manner as to facilitate their spiritual growth. Attendance at Chapel Services, which every student is expected to attend with a Bible, notebook and pen, are a compulsory and essential part of students' spiritual development. Students is also 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, habit and character, exuding self-confidence and dignity at all levels of interaction and in general conduct. They are expected to see themselves as persons of worth and value, taking pride in their uniqueness as individuals with a positive mind-set devoid of any trace of inferiority.

Capacity Building

This is related to commitment to a lifestyle of continuous academic and personal development, striving to be continuously relevant to the overall vision requirement of the University as well as her core mission, goals and objectives. 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 have 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, transparent and open in all their dealings. They shall flag truth as a virtue at all times, particularly in conduct during examinations, obeying the rules and regulations of the University, being spiritually sound, morally upright and having a good conscience.

Responsibility

We are committed to inculcating a sense of responsibility in our students. We believe in the place of discipline for effective leadership. We expect our students 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, is a desired trait of responsibility.

Diligence

Students of Covenant University are expected to be deeply committed to their assignments. We expect that they will extol the virtues of hard work and constantly strive towards excellent attainment in all they do.

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 and pay 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.

1.6 THE TOTAL MAN CONCEPT

The Total Man Concept (TMC) is Covenant University's custom-built Programme that constitutes the core concept of her academic programmes.

This concept centres on "developing the man that will develop his world." It is designed to make the student become intelligently conscious of his environment and thus be able to maximize his potential.

The programmes of the University are first directed at "the person" before his profession. In this way, the University will raise a generation of experts who possess the capacity to face and manage challenges.
The TMC Programme centres on three components of the human personality: the spirit, the mind, and the body.

The Spiritual Man
Spiritual development is to us a major force for the evolvement of the Total Man, as mental excellence and understanding are generated through the vital force in man, which is the Spirit of God and the Spirit of Intelligence. As a University sponsored by a Christian Mission, character formation is considered as a spiritual issue that is instilled by self-discipline and commitment to the principles enunciated by our Lord Jesus Christ.
Covenant University provides opportunities for spiritual development through various avenues, including spiritual formation programmes and counselling, and also by creating leadership opportunities.

The Intellectual Man
Covenant University students enjoy the highest standards of excellence through the institution of academic programmes that are innovative, creative and functional. Covenant University also encourages students to be inquisitive, bold and forthright in asking questions and facing the challenges of academic leadership. The Total Man concept is also promoted through the introduction of a system of compulsory, theoretical and practical courses, all of which must be passed before one can be considered for a degree from the University. In addition to normal General Studies courses, we have included our own specially-designed courses in areas such as: biographical studies, entrepreneurship, family life, human development process, leadership development, mental development, success concepts, work ethics and Towards the Total Graduate (TTG) Programme.

The Physical Man
The body is a vital component of the Total Man. Covenant University is committed to providing avenues for sound physical development via

recreational activities that engage the body and also enhance personality development, stimulating the cultivation of lifestyles that are conducive to healthy living. We thus encourage students to participate in sporting activities.

1.7 THE TOTAL GRADUATE

The Covenant University graduate will be mentally resourceful, intellectually reinforced, enterprisingly self-dependent, futuristically visionary and responsibility-sensitive to the changes demanded for the leadership role or dominion nature he is made for. He shall be a Total Man.

OUR CAMPUS

- Serene, safe, secure, pleasant and empowering ICT driven teaching and learning environment.
- Academic programmes free of strikes, shut-downs and union face-offs.
- Well-stocked libraries and laboratories, as well as unrestricted access to the Internet for study and research purposes.
- CU pioneered the introduction of:
    - Entrepreneurial Development Studies (EDS) aimed at preparing the Student for self-employment; and
    - The Total Man Concept (TMC) aimed at developing the Total Man –Spirit, Soul and Body

.

- Our graduates have additional certificate in Leadership upon completion of their studies.

Covenant University Landscape

Covenant University Landscape

CHAPTER TWO

ADMINISTRATION AND CONTROL

Covenant University was established by the World Mission Agency (WMA), an arm of the Living Faith Church Worldwide Inc. The Board of Trustees of the Agency appoints the members of Board of Regents, which is the apex ruling body for the University. In his capacity as the *visioner* of the University, Dr. David Oyedepo serves as the life Chancellor of the University and the Chairman of the Board of Trustees of World Mission Agency.

The University's Vision of raising a new generation of leaders has necessitated the development of a unique approach to governance and management of the institution. Its founding philosophy is to specifically and emphatically promote change against the status quo, which had stagnated growth and development in the nation and in the African continent. The University is committed to a visionary resolution of these issues.

The other organs by means of which the University administration is carried out include: the Senate, and Management Board. Other statutory and academic Boards are as explained.

2.0 BOARD OF REGENTS

The Board of Regents is the Governing Council of the University. The Board serves as the apex ruling body of the University and exercises final authority and power in all policy, legal, administrative and financial matters of the University. It has the overall responsibility for the policies and operations of the University.

2.1 THE CHANCELLOR

The unique founding philosophy of change, which was birthed from the visionary base of the University, as well as the adopted strategies for its accomplishments, was considered crucial to the general and specific objectives of the University. The visionary direction and guidance had compelled the executive presence of the Chancellor who conceived the vision of the University. Consequently, the vision as well as its governance imperatives is shared with the faculty, staff and students at regular intervals. This has permitted and continues to permit stable formation not only of the organizational structure but also of the management culture, as well as helping to inculcate the values and ethos of the University into members of the University community. The Chancellor of the University is the Chief Executive Officer of the University. He also serves as the Chairman of the Board of Regents.

2.2 THE VICE-CHANCELLOR

The Vice-Chancellor is the Chief Academic Officer of the University. In this capacity, he/she is the Chief Responsibility Officer for the University's operations. Academic administration is planted firmly in the highest academic authority of the University, which is the Senate. The Vice- Chancellor is the Chairman of University Senate and exercises all powers granted him/her in the law that established the University in respect of guiding and directing the University's academic activities. He/she holds in trust the Chancellor's executive responsibilities and authority in all areas where the Chancellor so delegates.

2.3 THE DEPUTY VICE-CHANCELLOR

The Deputy Vice-Chancellor is responsible to the Vice-Chancellor. The Deputy Vice-Chancello assists the Vice-Chancellor in providing administrative leadership to the University, and giving support to driving academic excellence in areas so assigned.

2.4 THE REGISTRAR

He is the Chief Administrative Officer of the University and oversees the administrative efficiency of the University, engaging historical records and regulations. The Registrar chairs the University's Administrative Board, which serves as the University's apex administrative organ and clearance house for all operational issues. He monitors rules, regulations and policies as well as make recommendations on policies to Senate and Board of Regents.

2.5 OTHER OFFICERS OF THE UNIVERSITY

(a) THE DEANS OF COLLEGES AND SCHOOL OF POSTGRADUATE STUDIES

Our Colleges were established to provide teaching, research and community service activities in Departments/Programmes approved for them by the Senate. A College Management Board and College Academic Boards are established for each College to determine direction and supervise the conduct and grading of examinations and other academic responsibilities and they make recommendations to Senate on any academic matter, including curriculum development and examination results through the Deans. The Dean is the Chief Academic Officer of the College/School. He is the Chairman of the College Management Board and he coordinates and regulates the teaching responsibilities and the conduct of examinations within the available facility and specified guidelines. He is also responsible for co-coordinating the day-to-day administration of the College, including the organization of students' admission, registration, matriculation and examinations.

b) THE DEPUTY DEANS OF SCHOOLS

Each College in the University is divided into three administrative units called Schools and a Deputy Dean heads each of them. The Deputy Deans oversee the coordination of activities of the School as they relate to the Colleges' Vision and Goals to ensure their foremost growth and development. They provide leadership and oversight for all the academic programmes of the Schools. They oversee strategic planning matters of the Schools and ensure that they are in tandem with the Vision of the University; continuous improvement of programmes and curriculum; promotion of community service activities; ensuring efficient teaching and quality delivery and monitoring of class attendance, student evaluation reports as they relate to the Schools' context, teaching and learning environment among others.

c) THE DIRECTOR, PHYSICAL PLANNING AND DEVELOPMENT

The overall development of Covenant University involves the provision of buildings, equipment, furniture, roads, water, electricity, healthcare facilities, educational facilities for the children of the staff and accommodation for staff and students. The Director of Physical Planning and Development is responsible to the Vice-Chancellor for the physical development as well as maintenance and care of the University estate. Officers of the unit are divided into three main groups: maintenance and services; rehabilitation; and development of new facilities.

d) THE DIRECTOR, CENTRE FOR LEARNING RESOURCES

The Centre for Learning Resources (CLR) is the academic heart of the University system. Its basic purpose is to provide students and all academic members of the community with materials, assistance and an environment that facilitate teaching, learning and research. Covenant University's Centre for Learning Resources is being continuously equipped, as a fundamental requirement for academic excellence. The Director of CLR is the head of the University Library, and he is responsible to the Vice-Chancellor in growing and developing the University Library system. This includes the main Library, College Libraries and the departmental reading rooms.

e) THE DIRECTOR, FINANCIAL SERVICES

The Director, Financial Services Department, is responsible for ensuring financial prudence in the allocation and utilization of the financial resources of the institution. This involves coordination, control and periodic evaluation of the financial system of the University, including the internal audit with a proactive audit strategy extending beyond compliance, probability and systems audit, to a value-for-money audit. The Director ensures that financial regulations are made, published in a Manual of Financial Procedures and followed through to ensure the efficient use of funds allocated to, or generated by the University.

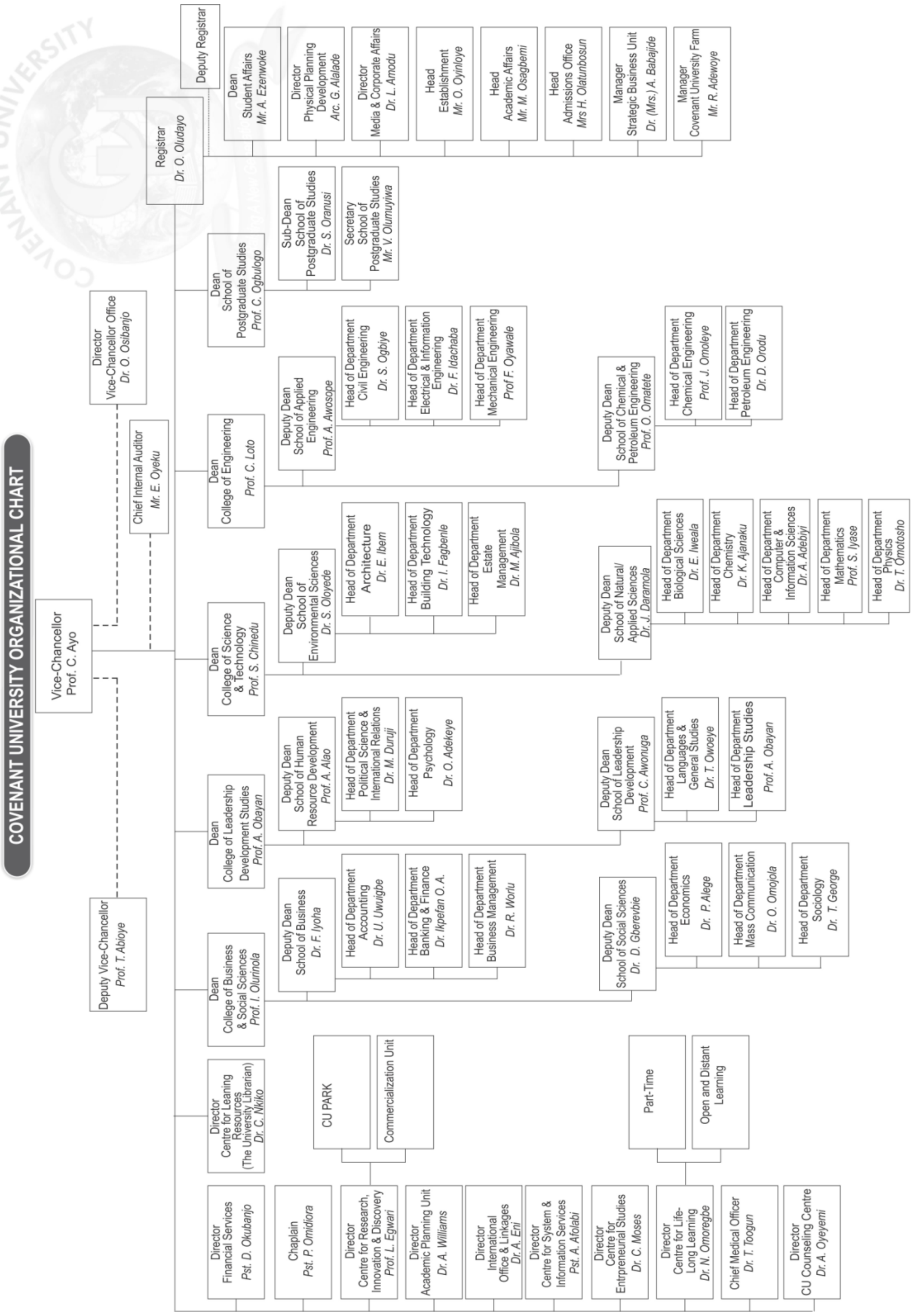
f) THE DIRECTOR, CENTRE FOR SYSTEM & INFORMATION SERVICES (CSIS)

The Director manages the information system, provides technical support for portal administration, internet and intranet services, training and deployment of systems.CSIS generates and manages data from various sources including candidates' admission, students' registration and examination processes for management decisions at various levels.

g) THE DIRECTOR, ACADEMIC PLANNING UNIT

The Director, Academic Planning Unit (DAPU) is saddled with the responsibility of collating, managing and interpreting data to guide the academic development of the University; and ensuring compliance with government policies, notably, the National Universities Commission (NUC) Benchmark Minimum Academic Standard (BMAS), the University status as they relate to academic matters and other academic requirements of Senate.

African Leadership Development Centre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Deputy Vice-Chancellor Prof. T. Abioye
Registrar Dr. O. Oludayo
Deputy Registrar
Dean Student Affairs Mr. A. Ezenwoke
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Director Media & Corporate Affairs Dr. L. Amodu
Head Establishment Mr. O. Oyinloye
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Manager Covenant University Farm Mr. R. Adewoye
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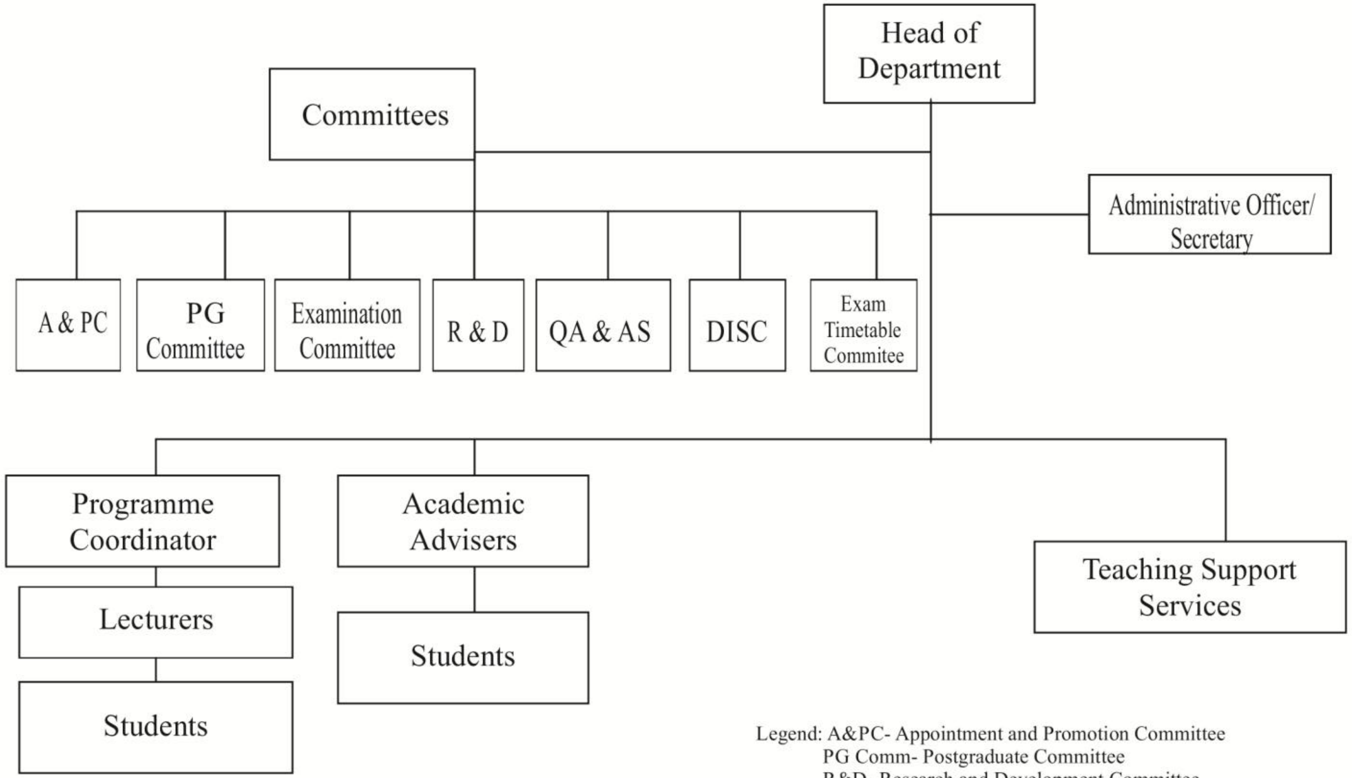
CU PARK
Commercialization Unit
Part-Time
Open and Distant Learning
Director Financial Services Pst. D. Okubanjo
Chaplain Pst. P. Omidiora
Director Centre for Research, Innovation & Discovery Prof. L. Egwari
Director Academic Planning Unit Dr. A. Williams
Director International Office & Linkages Dr. A. Eni
Director Centre for System & Information Services Pst. A. Afolabi
Director Centre for Entrpreneurial Studies Dr. C. Moses
Director Centre for Life-Long Learning Dr. N. Omoregbe
Chief Medical Officer Dr. T. Toogun
Director CU Counseling Centre Dr. A. Oyeyemi

(Top & Down) Members of the Board of Regents in academic procession during a Convocation Ceremony

DEPARTMENTAL ORGANIZATIONAL CHART



Legend: A&PC- Appointment and Promotion Committee
PG Comm- Postgraduate Committee
R&D- Research and Development Committee
QA&AS- Quality Assurance & Academic Standards Committee
DISC- Disciplinary Committee

Students matriculation procession

Students convocation procession

CHAPTER THREE

STUDENTS' ADMISSION AND GRADUATION POLICY

3.0 ADMISSION POLICY

"To admit young, single, disciplined and vision-driven candidates, who will be ready to accept full responsibility for the revolution being entrusted to them."

3.1 ADMISSION REQUIREMENTS

Jamb Pre-Requisite

Candidates applying to Covenant University are required to sit for the University Matriculation Examination (UME) of the Joint Admissions and Matriculation Board (JAMB) and attain the prescribed cut-off marks. In addition to the above, the University conducts aptitude and character-screening exercises for all candidates seeking admission into the University.

General Requirements

The minimum entry requirements for admission into Covenant University are credit level passes in 5 subjects at the SSCE/GCE O'Level/NECO/NABTEB or its equivalent obtained at not more than two sittings. The subjects passed must include English Language, Mathematics and one relevant Science subject, selected from the following group: Biology, Health/General Science, Food and Nutrition Science, Agricultural Science, Physics and Chemistry. Candidates are also to note that there are other requirements that may be specific to a College and/or a Programme.

3.2 GENERAL REGULATIONS FOR AWARD OF FIRST DEGREES

1. To be eligible for admission to a Bachelor's Degree programme in one of the Colleges of the University, a candidate must have:
   (a) satisfied the general requirements for admission into the University;

(b) satisfied the College or Departments' requirements for admission;
(c) followed the approved course of study for the prescribed period;
(d) passed the required examinations;
(e) paid all the prescribed fees; and
(f) complied with such other regulations and requirements as may be prescribed.

2. Before registering for a course, the student must meet the pre-requisites as prescribed for that course. Each student must complete the registration for each Semester within the period prescribed for registration.
3. Approved courses of study and syllabuses of courses for the examinations under these regulations and the number of papers in each course are those approved by Senate. Approved courses shall also include such lectures, tutorials, seminars, laboratory classes, fieldwork, as prescribed by departmental regulations, and such written work as the Department concerned shall require.
4. A candidate for a first degree must pass the prescribed examinations in the General Studies Programme. Each student will be required to take and pass courses in Entrepreneurial Development Studies and Total Man Concept. He must, in addition, complete all compulsory courses as prescribed in his/her programme.
5. A student shall be registered as a full-time student and enrol in any one semester for a minimum of 15 and a maximum of 25 units.
6. A candidate shall not be deemed to have followed any approved programme of study unless the Head of Department concerned certifies that his attendance and performance have been satisfactory.
7. Student Workload
   (a) Workload is defined in terms of course units.
   (b) One unit represents one hour of lecture or one hour of tutorial, or 3 hours of practical work per week throughout a Semester of fifteen weeks.

(c) All courses shall run for one Semester.

8. A candidate whose work or progress is considered unsatisfactory may be required by Senate, on the recommendation of the appropriate College to be on probation or withdraw from the University. Failure in an examination is regarded as evidence of unsatisfactory progress.
9. The duration of courses of study for a first degree shall normally not be less than four academic years. A student may be permitted to extend the period of study prescribed for a degree on condonable grounds as approved by Senate.
10. Candidate for examinations must register for these examinations at the prescribed times and in accordance with the conditions prescribed by the regulations for examinations.

3.3 GRADING SYSTEM

Class Test/Assignments = 20 marks

Mid-Semester Test = 10 marks

30%

Examination

End of Semester Examination = 70 marks - **70%**

100%

Interpretation of Grade	Points
A = 70 and above	5
B = 60 – 69	4
C = 50 – 59	3
D = 45 – 49	2
F = Below 45	0

3.4 GRADE POINT AND GRADE POINT AVERAGE

A Grade Point (GP) is the product of the Course Credit Unit (CU) and the Point Score (PS) in each course. {i.e. GP = CU x PS}. The sum of all Grade Points for the semester is the Total Grade Point (TGP). {i.e. TGP = ∑GP}. The Grade Point Average (GPA) is the TGP divided by the Total Credit Units (TCU). {i.e. GPA = TGP/TCU}. The following example illustrates how to calculate the GPA.

Example: A student registered for five courses and scored the marks shown in the Examination.

Course	Credit Unit (CU)	Score (%)	Grade	Point Score (PS)	Grade Point (GP)
BCH429	6	62	B	4.0	24
BCH421	3	48	D	2.0	6
BCH427	3	54	C	3.0	9
BCH329	6	72	A	5.0	30
GST221	2	60	B	4.0	8
TOTAL	**20**				**77**

TGP = 6 x 4 + 3 x 2 + 3 x 3 + 6 x 5 + 2 x 4 = 77
TCU = 6 + 3 + 3 + 6 + 2 = 20
GPA = TGP/TCU = 77/20 = 3.85

The highest GPA that can be earned is 5.0 and the lowest is 0 (zero)
The Cumulative Grade Point Average (CGPA) is the summation of the TGP for all semesters divided by the summation of TCU's for the said semesters. Like the GPA, the CGPA obtainable ranges from 0 to 5. The CGPA is calculated for all courses taken from the 1st semester (Alpha Semester) of the first year of entry (i.e. 100 levels) to the current semester.

The final award and class of the degree shall be based on the cumulative grade point average obtained by each candidate in all the prescribed courses and approved electives taken at the University. A candidate who has satisfactorily completed all requirements for the degree with an overall Grade Point Average of not less than 1.50 shall be awarded the Honours Degree.

3.5 DEGREE CLASSIFICATION

Classes of degree are to be awarded depending on the cumulative GPA obtained. The classes of degree that may be awarded are First Class Honours, Second Class Honours (Upper Division), Second Class Honours (Lower Division) and Third Class Honours.

CGPA	CLASS OF DEGREE
4.50 – 5.00	First Class
3.50 – 4.49	Second Class (Upper Division)
2.40 – 3.49	Second Class (Lower Division)
1.50 – 2.39	Third Class
Less than 1.5	Fail

3.6 ADMISSION TO DEGREES

After Senate has approved the report of the examiners, successful candidates shall be admitted to the Bachelors Degree at the Graduation Ceremony for the award of degrees. No Pass Degree is awarded in Covenant University.

Students signing matriculation register

Industrial Process Trainer

CHAPTER FOUR

COLLEGES, SCHOOLS AND DEPARTMENTS

There are presently four (4) Colleges in Covenant University – College of Business and Social Sciences (CBSS), College of Leadership Development Studies (CLDS), College of Engineering (CoE) and College of Science and Technology (CST). Each College is made up of two Schools. The Schools consists of Departments which run specific academic programmes.

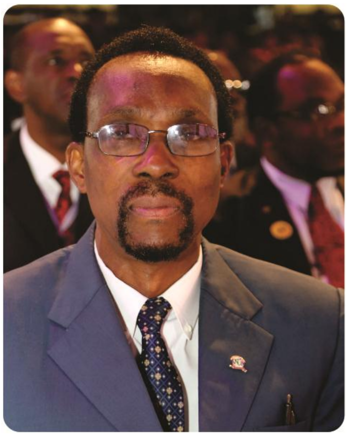
The Colleges, Schools, Departments and Programmes offered in Covenant University are shown in the Table below:

College	School	Department	Programme	Option	Degree
College of Business and Social Sciences	School of Business	Accounting	Accounting		B.Sc
		Banking and Finance	Banking and Finance		B.Sc
		Business Management	Business Administration		B.Sc
			Industrial Relations and Human Resource Management		B.Sc
			Marketing		B.Sc
			Entrepreneurship		B.Sc
	School of Social Sciences	Economics	Demography and Social Statistics		B.Sc
			Economics		B.Sc
		Mass Communication	Mass Communication		B.Sc
		Sociology	Sociology		B.Sc
College of Leadership Development Studies	School of Human Resource Development	Political Science and International Relations	International Relations		B.Sc
			Policy and Strategic Studies		B.Sc
			Political Science		B.Sc
		Psychology	Psychology		B.Sc
	School of Leadership Development	Languages and General Studies	English		B.A
		Leadership Studies	Leadership		Certificate/ Diploma

<table>
<tr><td rowspan="8">College of Engineering</td><td rowspan="6">School of Applied Engineering</td><td>Civil Engineering</td><td>Civil Engineering</td><td></td><td>B.Eng</td></tr>
<tr><td rowspan="3">Electrical and Information Engineering</td><td>Computer Engineering</td><td></td><td>B.Eng</td></tr>
<tr><td>Electrical and Electronics Engineering</td><td></td><td>B.Eng</td></tr>
<tr><td>Information and Communication Engineering</td><td></td><td>B.Eng</td></tr>
<tr><td>Mechanical Engineering</td><td>Mechanical Engineering</td><td></td><td>B.Eng</td></tr>
<tr><td colspan="0" style="display:none"></td></tr>
<tr><td rowspan="2">School of Chemical and Petroleum Engineering</td><td>Chemical Engineering</td><td>Petroleum Engineering</td><td></td><td>B.Eng</td></tr>
<tr><td>Petroleum Engineering</td><td>Chemical Engineering</td><td></td><td>B.Eng</td></tr>
<tr><td rowspan="18">College of Science and Technology</td><td rowspan="3">School of Environmental Sciences</td><td>Architecture</td><td>Architecture</td><td></td><td>B.Sc</td></tr>
<tr><td>Building Technology</td><td>Building Technology</td><td></td><td>B.Sc</td></tr>
<tr><td>Estate Management</td><td>Estate Management</td><td></td><td>B.Sc</td></tr>
<tr><td rowspan="15">School of Natural and Applied Sciences</td><td rowspan="3">Biological Sciences</td><td>Applied Biology and Biotechnology</td><td></td><td>B.Sc</td></tr>
<tr><td>Biochemistry</td><td></td><td>B.Sc</td></tr>
<tr><td>Microbiology</td><td></td><td>B.Sc</td></tr>
<tr><td rowspan="3">Chemistry</td><td rowspan="3">Chemistry</td><td>Industrial Chemistry</td><td>B.Sc</td></tr>
<tr><td>Analytical/ Environmental Chemistry</td><td>B.Sc</td></tr>
<tr><td>Materials/ Polymer Chemistry</td><td>B.Sc</td></tr>
<tr><td rowspan="2">Computer and Information Sciences</td><td>Computer Science</td><td></td><td>B.Sc</td></tr>
<tr><td>Management Information System</td><td></td><td>B.Sc</td></tr>
<tr><td>Mathematics</td><td>Industrial Mathematics</td><td></td><td>B.Sc</td></tr>
<tr><td rowspan="3">Physics</td><td rowspan="3">Industrial Physics</td><td>Applied Geophysics</td><td>B.Sc</td></tr>
<tr><td>Electronics and IT Applications</td><td>B.Sc</td></tr>
<tr><td>Renewable Energy</td><td>B.Sc</td></tr>
</table>

THE COLLEGE OF ENGINEERING (CoE)

4.0 DEAN'S WELCOME NOTE



It gives me great pleasure to welcome you to the College of Engineering, one of the four Colleges in Covenant University. The College was created from the College of Science and Technology in the 2014/2015 academic session following a restructuring of the academic base of the University in pursuit of vision 10: 2022. The founding Dean of the College is Professor Cleophas Akin Loto, a former Dean of the College of Science and Technology.

Vision

The vision of the College of Engineering (CoE) is to be a leading engineering centre of excellence involved in teaching, research and innovation.

Mission

The mission of the College is to provide, through innovative teaching and research, sound engineering education aimed at producing a new generation of highly motivated, competent, skilful and innovative professional and academic engineers with a burning desire to tackle Africa's developmental challenges. The College strives to generate and provide high quality and high-tech knowledge in a student-friendly environment for the purpose of producing well-prepared leaders of tomorrow.

Philosophy

The College, philosophically, aims at producing students with profound engineering knowledge in different disciplines collaborating in deployment of a wide range of skills and knowledge to provide solutions to societal problems. Situated in a Christian mission University, the College is committed to the goals of learning and faith – learning as both the means to and the result of dogged scholarship; and faith as the personal appropriation of truth for godly living.

Objectives

The objectives of the seven (7) programmes offered by the College were crafted with a view to producing job-ready graduates in engineering with appropriate IT skills and capacity for independent thinking, creativeness and resourcefulness. Each of the current five Departments of the College has articulated its specific mission and objectives as well as the specifics of its academic programmes in line with the vision and mission of the College.

Professor Cleophas Akin Loto
Dean, College of Engineering

Covenant University Landscape

College of Engineering

4.1 OVERVIEW OF THE COLLEGE OF ENGINEERING

At the inception of the University in 2002 and up till 2009, there were three Colleges: College of Business and Social Sciences (CBS), College of Human Development (CHD) and College of Science and Technology (CST). In 2009/2010 academic session, College of Business Social Sciences and College of Human Development, were merged to form the College of Development Studies (CDS) and six Schools were created, three each in CDS and CST. The Schools in CST were the School of Engineering and Technology (SET), School of Environmental Sciences (SES) and School of Natural and Applied Sciences (SNAS).

In 2014/2015 academic session, the College of Engineering (CoE) was carved out of the former College of Science and Technology and divided into two Schools, the School of Applied Engineering (SENG) and School of Chemical and Petroleum Engineering (SCPE). The College is headed by a Dean while the Schools are headed by Deputy Deans.

There are five (5) Departments and seven (7) programmes in the College. The Departments are Civil Engineering, Electrical and Information Engineering, Mechanical Engineering, Petroleum Engineering and Chemical Engineering. The Department of Civil Engineering runs programme in Civil Engineering; Department of Electrical and Information Engineering offers programme in Computer Engineering, Electrical and Electronics Engineering, and Information and Communication Engineering. The Department of Mechanical Engineering runs programme in Mechanical Engineering; the Department of of Chemical Engineering runs programme in Chemical Engineering while the Department of Petroleum Engineering offers programme in Petroleum Engineering.

All the programmes are accredited by both the National Universities Commission (NUC) and relevant professional bodies.

A cross section of faculty in the College of Engineering during the visit of the Vice-Chancellor, Professor Charles K. Ayo to the College

Centre for Learning Resources (University Liberary)

(Up and Down) Construction equipments

CHAPTER FIVE

SCHOOL OF APPLIED ENGINEERING

5.0 DEPUTY DEAN'S WELCOME MESSAGE

It gives me pleasure to welcome you to the School of Applied Engineering of Covenant University. The school was established in the College of Engineering to facilitate proper coordination of sound academic learning in the University. At the moment, the school has three Departments, namely: (a) Civil Engineering (b) Mechanical Engineering and (c) Electrical and Information Engineering. All the programmes are studied at both the undergraduate and postgraduate levels.

Vision

The vision of the School of Applied Engineering is in tandem with the overall vision of the university to be one of the best ten leading World-Class Universities (1 of 10 in 10) by the year 2022. To achieve this goal, the School is committed to quality teaching, research and properly organized community service with a view to raising a new generation of leaders in all fields of human endeavour in the engineering profession for national development.

Mission

The mission of the School of Applied Engineering is to pursue relentlessly best practices in all academic activities as they relate to engineering profession for the realization of sound knowledge capable of enhancing the individual's contribution towards the achievement of the Millennium Development Goals (MDGs) in Nigeria.

Philosophy

The clear philosophy of the School of Applied Engineering is anchored on producing competent and self-reliant engineers with analytical and practical mind, intellectually sound in their various disciplines and capable of making meaningful contribution to the underdevelopment challenges of Nigeria and indeed Africa.

Once again, I welcome you to the School of Applied Engineering and wish you a very successful study and enriching experience in Covenant University.

Professor Claudius Awosope
Deputy Dean, School of Applied Engineering

Covenant University Landscape

5.1 DEPARTMENT OF CIVIL ENGINEERING

OVERVIEW OF THE DEPARTMENT

The Department of Civil Engineering came into existence at the beginning of the 2004/2005 academic session. It runs an integrated sandwich programme to acquaint the students with the basic knowledge, practices and current advances in the field of Civil Engineering. Civil Engineering is concerned with the planning, design, construction, maintenance and environmental impact of buildings, roads, airports, waterways, railways, bridges, tunnels, docks, offshore structure, dams, water supply, drainage and irrigation systems/schemes, and other major works. The Programme in Civil Engineering is therefore designed to produce engineers that can meet the challenges in the afore-mentioned areas through service in governmental agencies/establishments, the building and construction industry.

In September 2009, Civil Engineering became one of the Departments in the School of Engineering within the College of Science and Technology. In the 2014/2015 academic session, the Department became part of the School of Applied Engineering presently in the College of Engineering. The Department graduated its first set of graduates in July 2009.

Vision

The Vision of the Department of Civil Engineering is to be a world leader in ground-breaking scientific and technological innovation and to train civil engineers who will collaborate with other professionals to create a sustainable world and enhance the global quality of life.

Mission

The Mission of the Department is to provide, through innovative teaching, research and community service, civil engineering education aimed at producing a new generation of highly motivated, competent, skilful and innovative professionals and students with a burning desire to tackle Africa's developmental challenges. Consequently, the Department strives to generate and provide high quality and high-tech knowledge in a student-friendly environment for the purpose of producing well-prepared engineering leaders of tomorrow.

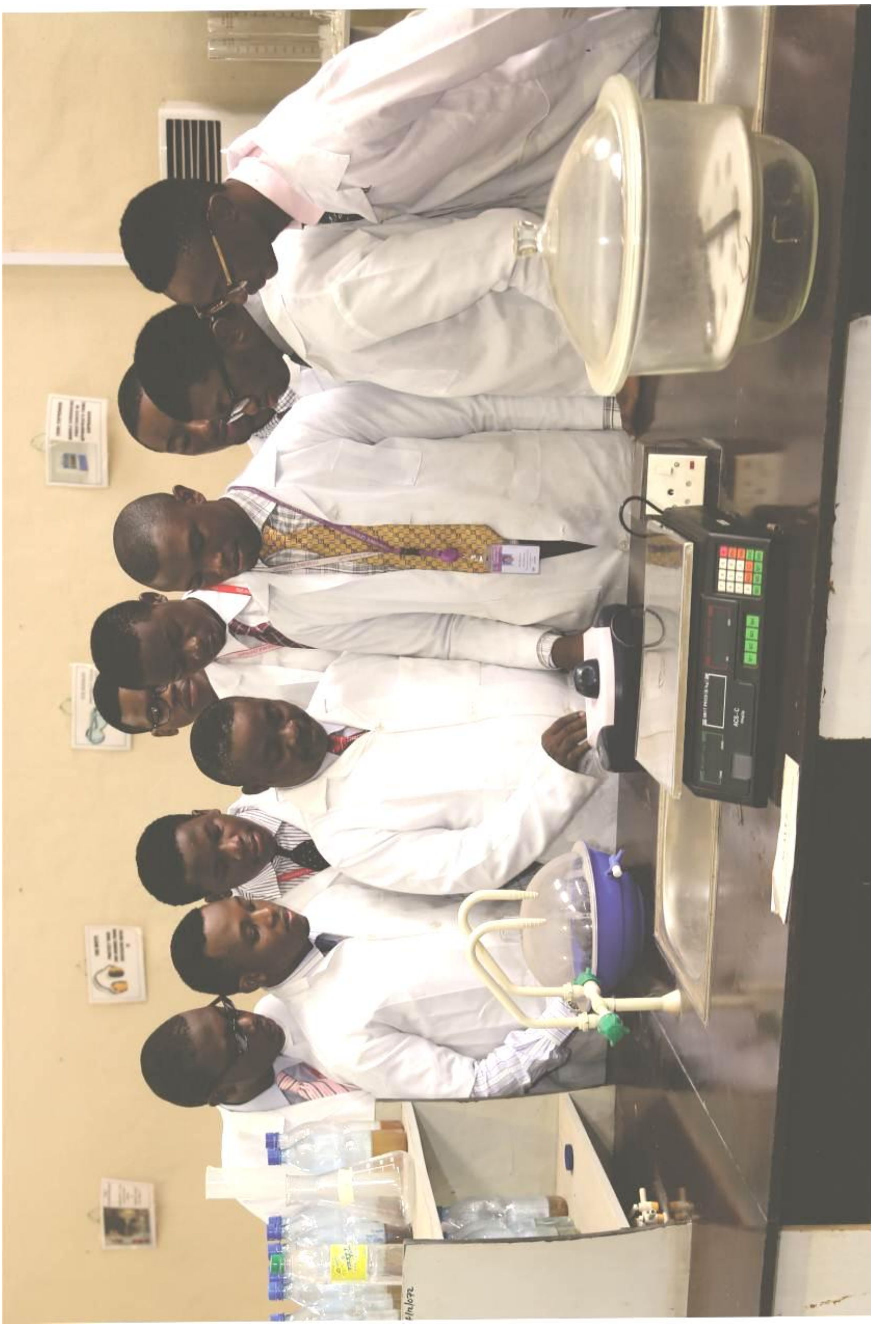
Philosophy

The Philosophy of the Department of Civil Engineering is in consonance with the overall Philosophy of Covenant University, which is a departure philosophy from dogmatism to dynamism. The Department adopts a very practical and realistic approach to the solution of all civil engineering problems based upon sound mastery of underlying theories in order to produce graduates who will impact their society and environment positively and bring about the desired changes that will be an example for others to follow. Our products are capable of making informed contributions to technological issues in a globalised environment.

Objectives

The objectives of the programme are to:

i. teach the student the fundamental concepts of Civil Engineering with which he/she can build his career to the highest degree of professional competence;
ii. develop the students in the application of technical knowledge, sense of analysis, creative design abilities, innovation and adaptability, and leadership qualities;
iii. provide the students the opportunity to develop, after a basic understanding of all areas of Civil Engineering practice, his/her special area of interest which include structural engineering, geotechnical engineering, transportation planning and highway engineering, water resources and environmental engineering, Civil Engineering planning, construction engineering and management; and
iv. provide practical training in the industries and other Civil Engineering establishments in preparation for professional practice.



Demonstration Equipment in Civil Engineering Laboratory

LIST OF ACADEMIC STAFF IN THE DEPARTMENT

S/N	NAME	ACADEMIC QUALIFICATION	PROFESSIONAL QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	Dr. S. A. Ogbiye	B.Sc, M.Sc, Ph.D	COREN, MNSE, C.Eng	Senior Lecturer/ HOD	Water Resources / Environ. Engineering
2.	Dr. D. O. Omole	B.Eng, M.Eng Ph.D	COREN, MNSE, C.Eng	Senior Lecturer	Environ/Hydraulics Engineering
3.	Dr. D. O. Olukanni	B.Eng, M.Eng, Ph.D	COREN, MNSE, C.Eng	Senior Lecturer	Environ/Hydraulics Engineering
4.	Dr. A. N. Ede	B.Sc, M.Sc, Ph.D	MNSE, Italian Soc. of Eng	Senior Lecturer	Structures/Materials Engineering
5.	Surv. A. S. Ojo	B.Sc, M.Sc	MNIS	Lecturer I	Surveying & Geoinformatics
6.	Engr. I. I. Akinwumi	B.Eng, M.Eng	MNSE, C.Eng	Lecturer II	Geotechnical / Materials Engineering
7.	Engr. G. O. Bamigboye	B.Eng, M.Eng	R.Eng (COREN)	Lecturer II	Structures
8.	Engr. A. A. Busari	B.Eng, M.Eng	R.Eng (COREN)	Lecturer II	Highway & Transport Engineering
9.	Mr. C. P. Emenike	B.Eng, M.Eng	NISP, PMP-CUPE Ltd, UK	Assistant Lecturer	Environmental & Water Resource Engineering
10.	Mr. O. M. Olofinnade	B.Eng, M.Eng	MNSE	Assistant Lecturer	Structures
11.	Mr. P. O. Awoyera	B.Eng, M.Eng	MNSE	Assistant Lecturer	Structures
12.	Mr. J. F. Ogundeji	B.Eng, M.Eng		Assistant Lecturer	Structural Engineering
13.	Mr. I. T. Tenebe	B.Eng, M.Eng	NISP, PMP-CUPE Ltd, UK	Assistant Lecturer	Environmental & Water Resource Engineering

VISITING LECTURERS

S/N	NAME	ACADEMIC QUALIFICATION	PROFESSIONAL QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	Prof. J. B. Olaleye	B.Sc, M.Sc, Ph.D		Professor	Surveying / Geoinformatics
2.	Prof. C. O. Coker	B.Sc, M.Sc, Ph.D	COREN, MNSE, C.Eng	Professor	Water Resources / Environ. Engineering
3.	Dr. A. O. Owolabi	B.Sc, M.Sc, Ph.D	FNSE, MASCE, PE, R.Eng	Associate Professor	Highway/Transportatio n Engineering
4.	Dr. J. A. Osunbitan	B.Sc, M.Sc, Ph.D	COREN, MNSE	Senior Lecturer	Water Resources/ Environmental Engineering
5.	Dr. F. A. Olutoge	B.Sc, M.Sc, Ph.D	COREN, MNSE	Senior Lecturer	Structures
6.	Dr. O. O. Ojuri	B.Sc, M.Sc, Ph.D	COREN, MNSE	Senior Lecturer	Geo Technical
7.	Dr. J. A. Olusina	B.Sc, M.Sc, Ph.D		Senior Lecturer	Geoinformatics / Surveying
8.	Engr Oduola M. A	B.Sc, M.Sc	FNSE	Lecturer I	Structures

TECHNOLOGISTS/TECHNICAL STAFF

S/N	NAME	QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	Rev. E. O. Badmus	HND, PGD	Chief Technologist	Structures/ Environmental/ Geotechnical Materials
2.	Mr. Jolayemi Joshua	HND, PGD	Senior Technologist	Structures
3.	Mrs O. Durotoye	HND, PGD	Technologist I	Structures /Geotechnical
4.	Mr. Idowu Niyi	HND	Technologist II	Transportation
5.	Mr. Adediran M.	HND	Technologist II	Structures/ Geotechnical
6.	Mr. B. O. Idowu	NBTC	Senior Lab Technician	Concrete / Carpentry
7.	Akhirebhu Nicholas	SSCE O Level	Lab Attendant	
8.	Olimaro Gift	SSCE O Level	Lab Attendant	

ADMINISTRATIVE STAFF

S/N	NAME	QUALIFICATION	STATUS
1.	Akinyemi Oluseun	B.Sc Business Administration	Administrative Officer
2.	Mrs. Beshiet Juliet	SSCE O Level	Office Assistant

5.1.1 CIVIL ENGINEERING PROGRAMME

PROGRAMME: Civil Engineering

DEGREE AWARDED: B.Eng Civil Engineering

DURATION: Five (5) Years (10 Semesters)

ADMISSION REQUIREMENTS

U.M.E. Requirements: The minimum entry requirement for admission into the Department of Civil Engineering is O/L SSCE/GCE/NECO Credit level pass in five (5) subjects, including English, Mathematics, Physics, Chemistry, and either credit pass in Further Mathematics, Biology, or Technical Drawing. U.M.E Subjects include English Language, Chemistry, Mathematics and Physics.

GRADUATION REQUIREMENTS

To graduate from the 5-year Bachelor of Engineering (B.Eng.) degree programme in Civil Engineering, students must have successfully completed a minimum of 210 Credit Units as shown below:

Graduation Required Units for B.Eng. Civil Engineering Programme

Level	100	200	300	400	500	Total	Notes
Core/ Compulsory	31	38	36	21	38	164	
Electives					4	4	
SWEP		0				0	SWEP is taken during the Long Vacation
Industrial Training [SIWES]				6		6	
College Courses						0	
University Courses	4	4	4	2	4	18	
NUC Courses	10	6	2			18	
Total	45	48	42	29	46	210	

COURSE STRUCTURE

100 Level Civil Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC117	Technical Drawing	C	2		α
	MAT111	Mathematics I: Algebra	C	3		α
	MAT112	Mathematics II: Trigonometry and Geometry	C	2		α
	PHY111	Mechanics and Properties of Matter	C	2		α
	PHY112	Heat, Sound and Optics	C	2		α
	PHY119	Physics Practicals I	C	1		α
	CHM111	General Physical Chemistry	C	3		α
	CHM119	General Chemistry Practical I	C	1		α
	MAT121	Mathematics V: Calculus	C	3		Ω
	MAT122	Mathematics VI: Vector Algebra	C	2		Ω
	PHY121	Electricity and Magnetism I	C	2		Ω
	PHY122	Atomic and Nuclear Physics	C	2		Ω
	PHY129	Physics Practicals II	C	1		Ω
	CHM121	General Organic Chemistry	C	2		Ω
	CHM122	General Inorganic Chemistry	C	2		Ω
	CHM129	General Chemistry Practical II	C	1		Ω
University Courses	EDS111	Entrepreneurial Development Studies I	V	1		α
	TMC111	Total Man Concept I	V	1		α
	TMC112	Total Man Concept – Sports	V	0		α
	EDS121	Entrepreneurial Development Studies II	V	1		Ω
	TMC121	Total Man Concept II	V	1		Ω
	TMC122	Total Man Concept – Sports	V	0		Ω
NUC General Courses	CST111	Use of Library, Study Skills and Information Communication Technology I	U	2		α
	GST111	Communication in English I	U	2		α
	CST121	Use of Library, Study Skills and Information Communication Technology II	U	2	CST111	Ω
	GST121	Communication in English II	U	2	GST111	Ω
	GST122	Communication in French	U	2		Ω
			α =22 Ω = 23 Total = 45 Units			

200 Level Civil Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	GEC210	Engineering Mathematics I	C	2		α
	GEC211	Introduction to Electrical Engineering I	C	2		α
	GEC212	Engineering Graphics	C	2		α
	GEC213	Material Science and Raw Material Studies	C	2		α
	GEC214	Applied Mechanics	C	3		α
	GEC215	Applied Computer Programming I	C	2	CST121	α
	GEC216	General Engineering Laboratory I	C	3		α
	GEC217	Engineer-In-Society	C	1		α
	GEC218	Workshop Technology	C	2		α
	CVE211	Introduction to Civil Engineering	C	2		α
	GEC220	Engineering Mathematics II	C	2	MAT121 MAT122	Ω
	GEC221	Thermodynamics	C	2		Ω
	GEC222	Computer Aided Design and Manufacture	C	2		Ω
	GEC223	Fluid Mechanics	C	2		Ω
	GEC224	Strength of Materials	C	2		Ω
	GEC225	Applied Computer Programming II	C	2		Ω
	GEC226	General Engineering Laboratory II	C	3		Ω
	GEC228	Introduction to Electrical Engineering II	C	2		Ω
SWEP	GEC229	Student Workshop Experience Programme (SWEP)	S	0		Ω
University Courses	EDS211	Entrepreneurial Development Studies III	V	1	EDS111	α
	TMC211	Total Man Concept III	V	1	TMC111	α
	TMC212	Total Man Concept –Sports	V	0	TMC112	α
	EDS 221	Entrepreneurial Development Studies IV	V	1	EDS121	Ω
	TMC221	Total Man Concept IV	V		TMC121	Ω
	TMC222	Total Man Concept - Sports	V	0	TMC122	Ω
NUC General Courses	GST211	Logic, Philosophy and Human Existence	U	2	GST111	α
	GST221	Nigerian People and Culture	U	2	GST121	Ω
	GST222	Peace Studies and Conflict Resolution	U	2	GST121 GST122	Ω
			α =25 Ω = 23 Total = 48 Units			

300 Level Civil Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	CVE311	Theory of Structures I	C	2		α
	CVE312	Fluid Mechanics II	C	2	GEC223	α
	CVE314	Introductory Engineering Geology	C	2		α
	CVE315	Engineering Surveying and Photogrametry I	C	2		α
	CVE316	Laboratory Practicals and Design Studio I	C	2		α
	CVE317	Civil Engineering Materials	C	2		α
	GEC310	Engineering Mathematics III	C	3	GEC220	α
	CVE318	Strength of Materials II	C	2		α
	CVE320	Civil Engineering Analysis	C	2		Ω
	CVE321	Theory of Structures II	C	2	CVE311	Ω
	CVE322	Soil Mechanics	C	2		Ω
	CVE323	Design of Structures I	C	2		Ω
	CVE324	Quantity Surveying and Estimating	C	2		Ω
	CVE325	Engineering Surveying and Photogrammetry II	C	2	CVE315	Ω
	CVE326	Laboratory Practicals and Design Studio II	C	2	CVE316	Ω
	CVE328	Elements of Architecture	C	1		Ω
	GEC320	Numerical Methods	C	2	GEC310	Ω
	GEC321	Engineer-in-Society II	C	1		Ω
	GEC324	Technical Communication	C	1		Ω
University Courses	EDS311	Entrepreneurial Development Studies V	V	1	EDS211	α
	TMC311	Total Man Concept V	V	1	TMC211	α
	TMC312	Total Man Concept – Sports	V	0	TMC212	α
	EDS321	Entrepreneurial Development Studies VI	V	1	EDS321	Ω
	TMC321	Total Man Concept VI	V	1	TMC221	Ω
	TMC322	Total Man Concept – Sports	V	0	TMC222	Ω
NUC General Course	GST311	History and Philosophy of Science	U	2		α
			α =21 Ω = 21 Total = 42 Units			

400 Level Civil Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	CVE410	Water and Wastewater Engineering	C	2		α
	CVE411	Civil Engineering Practice	C	2		α
	CVE412	Foundation Engineering	C	2	CVE322	α
	CVE413	Design of Structures II	C	3	CVE323	α
	CVE414	Engineering Hydraulics	C	2		α
	CVE415	Highways and Transportation Engineering I	C	2		α
	CVE416	Laboratory Practical and Design Studio III	C	2	CVE326	α
	CVE417	Structural Analysis	C	2	CVE320	α
	CVE418	Engineering Economics	C	2		α
	CVE419	Surface and Ground water Hydrology	C	2		α
SIWES (Industrial Training)	CVE429	Student Industrial Work Experience scheme (SIWES)	S	6		Ω
NUC General Courses	EDS411	Entrepreneurial Development Studies VII	V	1		α
	TMC411	Total Man Concept VII	V	1		α
	TMC412	Total Man Concept – Sports	V	0		α
			α =23 Ω = 6 Total = 29 Units			

500 Level Civil Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	CVE510	Water Resources Engineering	C	3		α
	CVE530	Geotechnical Engineering I	C	3	CVE 412	α
	CVE512	Structural Engineering	C	3	CVE417	α
	CVE513	Civil Engineering Seminar	C	2		α
	CVE515	Transportation and Highway Systems	C	3	CVE415	α
	CVE516	Laboratory Practicals and Design Studio IV	C	2	CVE416	α
	CVE517	Engineering Systems and Design	C	2		α
	CVE519	Student Project I	C	0		α
	CVE520	Environmental Engineering	C	3		Ω
	CVE522	Building Technology	C	2		Ω
	CVE523	Design of Structures III	C	3	CVE413	Ω
	CVE524	Engineering Management/Law	C	2	CVE418	Ω
	CVE526	Laboratory Practicals and Design Studio V	C	2	CVE516	Ω
	CVE521	Traffic Engineering	C	2	CVE415, CVE515	Ω
	CVE529	Student Project II	C	6	CVE519	Ω
Electives	Note: Select 2 Units from these electives					
	CVE514	Environmental Engineering Systems Design	E	2	CVE410	α
	CVE518	Highways and Transportation Engineering II	E	2	CVE415	α
	CVE532	Tunnel Engineering	E	2	CVE322, CVE412	α
	CVE531	Advanced Structural Engineering I	E	2	CVE417	α
	CVE525	Design of Hydraulic Structures	E	2	CVE419, CVE514	Ω
	CVE528	Transportation Systems Analysis and Design	E	2	CVE415, CVE518	Ω
	CVE542	Geotechnical Engineering II	E	2	CVE412, CVE530	Ω
	CVE541	Advanced Structural Engineering II	E	2	CVE417, CVE531	Ω
University Courses	EDS511	Entrepreneurial Development Studies IX	V	1		α
	TMC511	Total Man Concept IX	V	1		α
	TMC512	Total Man Concept – Sports	V	0		α
	EDS521	Entrepreneurial Development Studies X	V	1		Ω
	TMC521	Total Man Concept X	V	1		Ω
	TMC522	Total Man Concept – Sports	V	0		Ω
			α =22 Ω = 24 Total = 46 Units			

COURSE DESCRIPTION

100 Level

Alpha Semester

GEC117 - Technical Drawing I (2 Units)

Drawing Tools: Description, Uses and Maintenance, Line Work: Definition of points, lines and planes, Types of lines (Description, Uses), Dimensioning: Examples like arrow heads, solid dots and crosses; of straight lines, of circles, inadequate space dimensioning, Common Errors in line drawings, Lettering, Drawing Sheets Format, Border Lines and Title Block. Plane Geometry: Angles (Types and their construction), Triangles (Types and their construction), Quadrilaterals (Types and their construction), Polygons (Types and their construction), Circle and It's Parts, Inscribing and Circumscribing Circles, Tangents (Internal and External), Ellipse (Different Methods of construction), Plane and Diagonal Scales. Orthographic Projection: Basic Introduction: Description, Plan, Elevations, 1st Angle Projection, 3rd Angle Projection, Sectioning, Exercises.

MAT111 - Mathematics I: Algebra (3 Units)

Algebra of Sets; special sets ($\mathbb{N}\subset\mathbb{Z}\subset\mathbb{Q}\subset\mathbb{R}\subset\mathbb{C}$); theory of indices, law of logarithms, indical equations, surdic equations. Polynomials, the remainder and factor theorems; polynomial equations and inequalities-especially linear, quadratic and cubic. Solving quadratic equations and cubic equations with an integral root. Domain and zeroes of rational functions. Partial fractions. Permutations and combinations. The binomial theorem for any index and applications. Sequences and series of real numbers (including AP and GP). Algebra of complex numbers. Introduction to m x n matrices; elementary operations on matrices and applications to solution of linear equations. Elementary properties of determinants of at most 3 x 3 matrices; The Rule of Sarrus.

MAT112 - Mathematics II: Trigonometry and Geometry (2 Units)
Trigonometric functions; exponential and logarithmic functions. Circular measure; hyperbolic functions. Equations of lines and planes; conic sections (circle, parabola, hyperbola, ellipse).

PHY111 - Mechanics and Properties of Matter (2 Units)
Physical quantities; Units and dimensions. Scalars and vectors. Kinematics. Dynamics; Newton's laws of motion; particles; rigid bodies; simple harmonic motion. Friction. Work, energy and power. Centre of mass. Newton's law of universal gravitation; Kepler's laws. Pressure in fluids. Intermolecular forces. Surface tension. Hook's law, Young's modulus.

PHY112 - Heat, Sound and Optics (2 Units)
Temperature and zeroth law of thermodynamics; thermometers. Heat transfer. Kinetic theory of gases. Gas laws. First and second laws of thermodynamics. Concept of waves; transverse and longitudinal waves; standing waves; production in pipes and strings; beats. Dopler effect. Electromagnetic spectrum. Huygen's Principle. Images formed by a single surface; spherical mirrors and thin lenses; aberrations; the eye, optical instruments. Interference; single slit. Diffraction; grating. –Polarization; elementary examples.

PHY119 - Physics Practicals I (1 Unit)
Simple experiments illustrating the topics covered in PHY111 and PHY112. A selection from the following experiments use of measuring instruments, viscosity, surface tension oscillations about an equilibrium position, Hooke's law, moment of inertia, focal lengths of lenses, refractive index, optical instruments, the sonometer heat capacity, volume expansion and latent heat.

CHM111 - General Physical Chemistry (3 Units)
Historical development of the atom: definition of atoms, Dalton's atomic theory, relative atomic masses. Fundamental particles of the atom and atomic structure. Modern electronic theory of atoms; electronic

configuration of the elements. Periodicity of the elements. Radioactivity: Stoichiometry: mole concept, chemical formulas, equations and calculations. States of matter: gas – empirical gas laws, Ideal Gas Equation of State, qualitative treatment of kinetic theory of gases, real gases and deviations from ideal gas laws; liquid, – macroscopic properties of liquids, evaporation, vapour pressure and its variation with temperature, boiling point, heat of vaporization, Clausius-Clapeyron equation, freezing point, melting point and phase diagrams of simple systems; solids – types of solids and their properties, ionic solids and lattice energy, crystalline solids. Chemical Energetic: definition of some thermodynamic terms, heat, work, internal energy, enthalpy, pressure-volume work. Relationship between internal energy and enthalpy. First law of thermodynamics and its applications. Chemical Kinetics: rate of reaction, factors affecting reaction, order of reaction and how to determine it for zero order and first order reaction, rate of equation and temperature, reaction mechanisms and rate equation for simple reactions. Chemical Equilibrium: reversible reactions and chemical equilibrium, equilibrium constant, factors affecting equilibrium. Le Chatelier's Principle. Effect of temperature on equilibrium constant. Relationship between equilibrium constant and standard Gibbs Free Energy, ΔG^{o}. ionic equilibrium. Electrochemistry: types of conductors, classification of compounds, electrolysis, Faraday's laws of electrolysis. Application of electrolysis. Introduction to electrochemical cells.

CHM119 - General Chemistry Practical (1 Unit)

Practice in weighing and measurement of volume, preparations of standard solutions. Titrimetry: acid-base, oxidation-reduction, precipitation and complex metric titrations; gravimetric analysis.

Omega Semester

PHY121 - Electricity and Magnetism I (2 Units)

Coulomb's law. Capacitors.Ohm's law; conductivity, Kirchhoffs laws. Electrical energy, DC bridges; Wheatstone; potentiometer Magnetic effect of current; electromagnetic induction; moving coil galvanometers; multi-meters. DC and AC motors; generators. Power in AC circuits. Rectification.

PHY122 - Atomic and Nuclear Physics (2 Units)
Atomic structure. Thompson, Rutherford and Bohr's theories. The hydrogen atom. Properties of the electron, e/m, Milliken's experiment. Properties of the nucleus, natural radioactivity. Wave particle duality of light, x-rays, photo-electricity, thermionic emission, diode valve.

PHY129 - Physics Practical II (1 Unit)
A selection of experiments to illustrate the principles covered in PHY121 and PHY122. The following experiments, among others shall be considered: potential difference and internal resistance of cells, uses of potentiometer circuit, the meter bridge, simple direct current measuring instruments, Planck's constant, radioactivity.

MAT121 - Mathematics V: Calculus (3 Units)
Functions of Real Variables: Graph, Limits and Concepts of Continuity. Techniques of Differentiation of Algebraic and Trigonometric Functions, Higher Order Derivates, Maxima and Minimal, Leibnitz Rule, Application of Differentiation. Integration as Inverse of Differentiation, Methods of Integration, Definite Integra. Application to Areas, Volumes, Moment of Inertial. Approximate Integration: Trapezoidal and Simpson's Rule. Taylor's and Mclaurin's Theorems, partial Differentiation and Implicit Differentiation.

MAT122 - Mathematics VI: Vector Algebra (2 Units)
3-Dimensional Cartesian Coordinate Systems. Definition and Representation of Vectors, Algebra of Vectors, Multiplication of a Vector by a Scalar, Addition of Vectors, Scalar Products of two Vectors, Direction Cosines, Calculus of Vector Functions, Differentiation of Vector Function, Integration of Vector Function. Conic: Circles, Parabola, Ellipse and Hyperbola.

CHM121 - General Organic Chemistry (2 Units)

Historical survey of the development and importance of organic chemistry. Nomenclature and classes of organic compounds. Homologous series, functional groups, isolation and purification of organic compounds. Qualitative and quantitative organic chemistry, stereochemistry, determination of structure of organic compounds. Electron theory in organic chemistry; saturated hydrocarbons, unsaturated hydrocarbons.

CHM122 - General Inorganic Chemistry (2 Units)

Periodic table and periodic properties, chemical bonding, structures of solids. The chemistry of selected representative elements. Quantitative analysis, hybridization.

CHM129 - General Chemistry Practical II (1 Unit)

Qualitative inorganic and organic analysis for elements in Groups I, II, IIIA, IIIB, IV. Chemical analysis for functional groups: acidic, kenotic, carboxylic, etc.

200 Level

Alpha Semester

CVE211 - Introduction to Civil Engineering (2 Units)

Introduction to various fields of engineering. Definition of Civil Engineering. History of Civil Engineering. Areas under Civil Engineering. Requirements for the course. Equipments used in practice. Related local and international professional bodies. Duties, Ethics and code of practice of the profession. Relationship with other branches of engineering. The role of civil engineering in the development of Nigeria with special reference to problem of amenity and the influence of engineer on the environment. Planning of cities and rural settlements. Report writing presentation of engineering data and technical material in various written forms. Practice in oral presentation.

GEC210 - Engineering Mathematics I (2 Units)

Functions: inverse trigonometric functions and principal values, hyperbolic & its inverse, graphs. Concepts of continuity and differentiability. Mean-value theorem. Sequences: real numbers, monotone, convergence, limits. Infinite series: convergence tests, addition, multiplication. Power series, radius of convergence, integration, differentiation of power series, Taylor's series expansion. Complex numbers: Real and imaginary parts, the complex plane, terminology and notation. Complex algebra, DeMoivre's theorem, powers and roots of complex numbers. Euler formula. Elementary functions of a complex variable, polynomials, rational, exponential, trigonometric, hyperbolic, logarithmic, inverse trigonometric and inverse hyperbolic functions. Vectors in R^n space, addition and scalar multiplication, linear combination of vectors, idea of linear dependence and independence. Dot and cross products, triple products, lines and planes.

GEC211 - Introduction to Electrical Engineering I (2 Units)

Fundamentals of electric, electromagnetic and electrostatic circuits. Transients in RC and RL dc circuits. Steady-state dc circuit analysis: Source conversion, Kirchoff's laws, Mesh analysis, nodal analysis, Thevenin and Norton theorems, superposition principle, star-delta transformation, Maximum power transfer. Steady-state ac -circuit analysis: Phasors and phasor diagrams, Power triangle, power factor and power factor improvement, frequency response of RLC circuits, resonance. Introduction to simple diode and transistor circuits and characteristics: Amplification & rectification. Introduction to digital systems.

GEC212 - Engineering Graphics (2 Units)

Lettering, linework, dimensioning, orthographic projection, sectioning, isometric and oblique pictorial views. Graphical calculus, Architectural Drawing, electrical and communication, and IT symbols and drawing.

GEC213 - Materials Science and Raw Materials Study (2 Units)

Raw material deposit survey in Nigeria: quantity, location. Processing techniques, and existing processed products. Material characteristics, and composition. Material re-cycling. Physics of materials. Chemistry of materials.

GEC214 - Applied Mechanics (3 Units)

Forces, moments, couples. Equilibrium of simple structures. First and second moments of area; centroids. Kinematics of rigid bodies in plane motion. Applications of Newton's laws of motion. Kinetic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature. The stress circle, deflection, deflection of beams. Shear forces and bending moments, analytical and graphical methods for structures. Design and analysis of communication towers, standards, and regulations.

GEC215 - Applied Computer Programming I (2 Units)

Software development life cycle (SDLC): Definitions, SDLC models: Waterfall model, V-shaped model, Incremental Model, Spiral Model. Program Design: Algorithms: Key features of algorithms and different ways of presenting algorithms. Flow charting of algorithms. Pseudocode: Pseudocode statements for Input, Output, Iteration, Decision, and Processing, Arithmetic, Relational and Logical Operations in Pseudocodes, use of sub-process in Pseudocode. Introduction to QBASIC Programming: Symbols, Keywords, Identifiers, Data Types, Operators, Control Structure, Functions, Procedures. Arrays: 1-D and Multidimensional Arrays. File handling: Concept of files, files and streams, standard file handling functions binary files, random access files.

GEC216 - General Engineering Laboratory I (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to Electrical Engineering, Materials Science, Applied Mechanics, Applied Computer Programming I and Workshop Technology Courses.

GEC217 - Engineer-In-Society (1 Unit)

Science, Technology and Development: Ethical concepts of development. Indicators of development, and the role of science and technology. The contribution of Government to the process of development and the Nigerian experience in the process of economic development (Nigerian Five Year Development Plans, successes and setbacks). Limits of growth, appropriate technology and a new world of science and technology. Science, Technology and Society: The inter-relationship of social ethics and values, and science and technology. Societal needs and resources in the genesis and development of science and technology. Social problems, impact assessment, and control of science and technology. Responsibilities of engineers. Science, Technology and Environment: Disruption or enhancement of environmental quality through harmful or sound science and technology in relation to air, space, water, land, populations, agriculture, industry, wild life, human settlements, culture, education, etc. Ethics and Professionalism: Theistic and secular concepts of personal, social and professional ethics. Codes of conduct of engineers. Motivation, control, responsibility, rewards and accountability of engineers and development of an ethical engineering professionalism. Council of Engineers and Engineering Societies.

GEC218 - Workshop Technology (2 Units)

Introduction to engineering workshop practice covering mechanical, electrical, information engineering, civil, chemical, and petroleum engineering. Use of hand tools, and safety measures in these fields.

Omega Semester

GEC220 - Engineering Mathematics II (2 Units)

Partial Differentiation: Functions of several variables, continuity and partial derivatives. Total differentials, approximate calculations using differentials. Chain rule. Implicit differentiation. Series representation of functions (Maclaurin & Taylor's series), Taylor's Theorem. Extremum problems, (analytical method) without and with constraints, Lagrange multipliers, global extremum. Ordinary Differential Equations: Definition, degree, order, linear, non-linear, solution. first order differential equations, separable variables, equations reducible to separable form, exact equations, integrating factors, homogenous differential equations. Modeling of engineering systems leading to first order differential equations - electric circuit, mixing/dilution, radioactive decay, bacterial culture. 2^{nd} order differential equations with constant coefficients, homogeneous, non-homogeneous, complementary functions, particular integrals, D-operator method. power series solution, Lengendre differential equation. Modeling of engineering systems leading to 2^{nd} order differential equations – electric circuit, mechanical oscillations-free and forced, resonance. Matrices and Determinants: Solution of system of linear equations by determinants. Linear dependence and independence, rank of a matrix. General system of linear equations, existence and properties of solution, Gaussian elimination. Matrix inverse by elementary matrices, adjoint, and partitioning methods. Characteristic polynomial, characteristic equation, eigenvalues and eigenvectors.

GEC221 - Thermodynamics (2 Units)

Basic concepts, quantitative relations of zeroth, first, second and third laws of thermodynamics. Behaviour of pure substances and perfect gases. Ideal gas cycles.

GEC222 - Computer Aided Design and Manufacture (2 Units)

AutoCAD: principle and use of Autocad. Electronic drafting and use of Autocad in electrical, electronic, computer & communication engineering design. System's manual writing, component assembly instruction manual preparation. Oral Communication: Public speaking skills with effective use of visual aids and statistical and technical information. Principles of effective communication in interpersonal and mass communication process. Effective reading skills-extracting main ideas and reading for specific information through speed reading. Written Communication: Principles of technical writing.

GEC223 - Fluid Mechanics (2 Units)

Properties of fluids. Fluid statics. Density, pressure, surface tension, viscosity, compressibility, etc. Basic conservation laws, friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamics similitude, principles of construction and operation of selected hydraulic machinery. Hydropower systems.

GEC224 - Strength of Materials (2 Units)

Forces, moments. Equilibrium of simple structures and machine parts. Kinematics of particles and rigid bodies. Newton's laws. Kinetic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature change. Stress circle. Deflection of beams. Shear forces and bending moments. Analytical and graphical methods for structures.

GEC225 - Applied Computer Programming II (2 Units)

Review of QBASIC and Introduction of Visual BASIC, Comparison of QBASIC and VBASIC. Creating applications. VBASIC Integrated Development Environment. Menu Design, Use of Procedures, Functions, Subroutines, and Event Procedures. Opening and Saving Pictures to folders. Writing to and Reading from files e.g. Notepad, MsWord. Writing to and Reading from Database e.g. Access. Writing to and Reading from Text and database over the NET., Printing. Multimedia with VB: Sound, Music, and Video, Animation with VB. Calling other Applications from VB (Shell execute), html, pdf, doc, files.

GEC226 - Engineering Laboratory II (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to electrical Engineering, Materials science, Applied Mechanics, Applied Computer Programming I, and Workshop Technology courses.

GEC228 - Introduction to Electrical Engineering II (2 Units)
Analysis of Magnetic circuits, Hysteresis and eddy currents, three phase circuits, three-phase power measurement, Transformer theory; short-circuit and open-circuit tests, voltage regulation, efficiency. Electrical machines; constructional features and operation of dc generators and motors; single-phase and 3-phase motors and generators, electric energy utilization for lighting and heating. Tariffs.

GEC229 - Students Work Experience Programme (SWEP) (0 Unit)
Introduction to practices and skills through supervised hands-on workshop exercises in computer engineering and information & communication technology, and related general engineering. These exercises include familiarisation with basic tools, soldering and de-soldering skill of pass-through & surface mount components, building of simple electronic circuits, troubleshooting of electronic devices, digital systems, etc. Use of hand drill. Safety precautions in handling.

300 Level

Alpha Semester

CVE311 - Theory of Structures I (2 Units)
Analysis of determinate structure, beams, trusses, structure theorems. Graphical methods. Application to simple determinate trusses. Williot-Mohr diagram. Deflection of statically determinate structures. Unit load, moment area methods. Strain energy methods. Introduction to statically indeterminate structures.

CVE312 - Fluid Mechanics II (2 Units)
Fluid statics: Floatation and stability. Dynamics of fluid flow-conservation. Equation of mass an momentum. Euler and Bernoulli's equations. Reynoulds number. Dimensional analysis, similitude, Buckingham Pi-theorems. Application of hydraulics models. Flow measurements.Flow meters and errors in measurement.

CVE314 - Introductory Engineering Geology (2 Units)
Relevance of geology to engineering. Summary of the structure of the planet earth. Minerals and rocks; the common rock-forming minerals – origin, distribution, identification and classification. External earth processes: weathering; principle, processes and agents. Erosion and evolution of land forms. Sedimentation; principles and processes. Sedimentary rocks Basic principles of stratigraphy; the geologic time scale; the importance of fossils. Internal earth processes; igneous processes – plutonic & volcanic: metamorphic processes, metamorphism types; deformation processes, fault and folds. Fundamentals of plate tectonics; earthquakes. Distribution of rocks minerals and principal geologic features (structures) in Nigeria.

CVE315 - Engineering Surveying and Photogrammetry I (2 Units)
Chain surveying, compass surveying – methods: contours and their uses. Traversing – methods and application. Levelling Geodetic leveling erros and their adjustments. Applications Tacheometry – methods, substance heightening, self adjusting and electromagnetic methods. Introduction to photogrammetry.

CVE316 - Laboratory Practicals and Design Studio I (2 Units)
Laboratory investigations and report submission on selected experiments and projects drawn from Fluid mechanics, Civil engineering materials. Laboratory works in indeterminate arches, suspension bridges.

CVE317 - Civil Engineering Materials (2 Units)
Concrete technology – types of cements, aggregates, properties. Concrete mix design. Properties and their determination. Steel technology – production, fabrication and properties, corrosion and its prevention. Test on steel and quality control. Timber technology – types of wood, properties and defects. Stress grading . Preservation and fire protection. Timber products. Rubber plastics. Asphalt, tar, glass, lime pricks mud, etc. application to buildings, roads and bridges.

CVE318 - Strength of Materials II (2 Units)
Advance topics in bending moments and shear force in beams. Theory of bending of beams.Deflection of beams. Unsymmetrical bending and shear center, and applications Strain energy. Biaxial and triaxial state of stress. Transformation of stress. Mohr circle. Failure theories. Springs. Creep, fatique, fracture and stress concentration.

GEC310 - Engineering Mathematics III (3 Units)
Fourier Series: periodic functions, trigonometric series. Fourier coefficients, Parsevals theorem, Functions of arbitrary period, even and odd functions. Half range expansion. Complex form of Fourier series. Transforms: Derivation of transforms and inverses (Fourier and Laplace). Applications of these transforms in boundary and initial value problems. Z-transforms. Partial Differential Equations: Basic concepts of partial differential equations. Classification of 2nd order linear partial differential equation into basic types. The principle of superposition. Modeling of physical systems leading to partial differential equations. The wave, diffusion and Poisson's equations. Boundary and initial-value problems. D'Alembert's solution for the wave equation. Solution by method of separation of variables. Biharmonic equation. Multiple integrals: iterated integrals, multiple integrals over elementary regions. Change of variables, Jacobians. Differentiation of integrals involving a parameter, Leibnitz's rule. Vector algebra: Vector field, gradient and directional derivative, divergence, curl. Line and surface integrals, Stoke's theorem. Volume integrals, divergence theorem. Orthogonal transformations, scale factors, basis vectors. Cylindrical and spherical polar coordinate systems, gradient divergence and curl in these systems.

Omega Semester

CVE320 - Civil Engineering Analysis (2 Units)
Mathematical formulation of simple engineering problems. Matrix analysis, vector analysis, solution of ordinary and partial differential equation and engineering applications. Laplace transform, Fourier series,

Bessel functions, Hermnic analysis, complex functions and confined mapping – numerical methods. Descriptive statistical inferences; application to physical and engineering problems. Regression and correlation. Design of experiment, analysis of variance. Derived distributions and statistical models and applications in engineering.

CVE321 - Theory of Structures II (2 Units)
Degree of determinancy and releases. Analysis of indeterminate structures by virtual work and energy methods. Analysis of of two hinged and fixed arches including secondary effects. Influence lines for indeterminate structures, application of Muller-Breslau principle, influence line diagrams for reactions, shear force, moment and deflection. Matrix methods.

CVE322 - Soil Mechanics (2 Units)
Introduction: Soil Mechanics, Foundation Engineering & Geotechnical Engineering; Formation of soils and their Characterization; Soil Phase relationships; Index properties: Gradation of Soils; Consistency/Atterberg Limits; Classification of Soils: AASHTO, USCS, etc.; Seepage and permeability, and ground water flow; Capillarity, Effective Stress and Pore-water Pressure.

CVE323 - Design of Structures I (2 Units)
Fundamental of design process, materials selection, uilding regulations and code of practice. Design philosophy, elastic design, limit state design. Design of structural elements in reinforced concrete.

CVE324 - Quantity Surveying and Estimating (2 Units)
Bills of quantities; Price build up, analysis of work content and method statement. SMM specifications, resource rates etc. Types of building contracts: measurement and cost reinbursement contracts. Condition of contracts. Measurement contracts. Final accounts measurement. Fixing of rates, estimating etc. Analysis of tender and evaluation of building projects.

CVE325 - Engineering Surveying and Photogrammetry II (2 Units)
Element of photogrammetry, photogrammetry equipment, principles and uses. Errors of measurements. Evaluation of single photographs. Further work on contours and contouring. Methods of contourising; contour interpolation and uses of contour plans and maps. Areas and volumes. Setting out of engineering.

CVE326 - Laboratory Practicals and Design Studio II (2 Units)
Laboratory investigations and report submission on selected experiments and projects drawn from soil mechanics – Soil classification, identification and physical properties, soil survey and soil map study.

CVE327 - Technical Report Writing (2 Units)
Principle of effective communication. Professional use of the English language. Principle of technical writing. Oral presentation of technical ideas.

CVE328 - Elements of Architecture (1 Unit)
Introduction – Dimensional awareness, graphic communication, relation to environments. Free-hand drawing – form in terms of; perspective projections; applications. Orthographic drawing, Common curves. Elementary designs. Shades light and shadow. Diametrics.

GEC320 - Numerical Methods (2 Units)
Numerical Methods: Finite difference. Interpolation. Numerical differentiation and integration. Numerical solution of ordinary differential equations, Trapezoidal, Simpson, Runge Kutta methods. Newton Raphson method for roots of equations. System of simultaneous linear equations. Linear simultaneous equations, Gaussian elimination, Gauss-Seidel iterative method, Jacobi Method, evaluation of determinant and inverse matrix. Eigen system analysis: system stability, eigen value sensitivity, stability of Gauss-Seidel solution, amplitude and time scaling for model studies. Use of numerical analysis software packages to solve simple engineering problems. Introduction to linear programming (or linear optimization) - Graphical and Simplex methods.

GEC321 - Engineer-in-Society II (1 Unit)
Introduction to engineering economy and law for engineers.

GEC324 - Technical Communication (1 Unit)
Introduction to Communications: Principles of effective communication in interpersonal and mass communication process. Verbal, graphical and numerical communications. Written Communication: Principles of technical writing. Types of technical writing, referencing and citation. Styles of writing. Graphs; diagrams presentation. Statistical information presentation. Macro level and micro-level. Oral Communication: Public speaking skills, multi-media presentation skills. Facilitator and participant skills in meetings. Negotiating skills. Idea-generating skills. Speaking and presentation involving media and telecommunications. Reading skills: Effective reading skills: extracting main ideas and speed-reading, chunk/cluster-reading and word-attack techniques of technical reading materials. Equipment Manual Writing and Presentation: Component diagrams, assembling, description, and multi-language presentation. Basic troubleshooting information, and technical support information. Marketing strategy.

400 Level

Alpha Semester

CVE410 - Water and Wastewater Engineering (2 Units)
Water and waste water inter-relationship, water health, water borne diseases. Elements of water chemistry. Treatment process for surface water and for groundwater. Design fundamentals for water supply, treatment and water distribution systems, including storage, pumping and piping. Sources of waste water, industrial and domestic waste water survey. Elements of wastewater microbiology, waste water collection, treatment and disposal and design. Wastewater re-use options and alternatives. Effluent standards.

CVE411- Civil Engineering Practice (2 Units)

Civil engineering works standard and measurements. Contracts and sub-contracts for Civil engineering Works: Simplified industry model of parties and basic business laws of relations. Construction supervision and client's office involvement. Job planning and control – programme. Bar charts, Critical path methods, and applications. Basic methods on varied nature of construction works (broad principles only) Including: Foundation, preparation, cofferdam and caisson, pile foundation, bridges foundations; Transport – road, railway, harbour and river works, pipelines; Special structures – Dams, shafts and tunnels. Preservation of structures.

CVE412 - Foundation Engineering (2 Units)

Soil Mineralogy; Stresses in soils due to external loads; Lateral Earth Pressure: Rankine and Coulomb theories; Earth retaining structures; Stability of slopes: infinite and finite slopes; Compaction and soil stabilization: Proctor and West African compaction methods, optimum moisture content, zavc, field and laboratory methods, compaction control and equipments; Bearing capacity: Shallow Foundations, Deep foundations: piles, drilled piers and caissons; Site investigations, and methods of subsurface exploration.

CVE413 - Design of Structures II (3 Units)

Limit state philosophy and design in steel. Elastic and plastic moment designs. Design of structural elements in steel and connections and joints. Limit state philosophy and design in timber. Elastic methods and design in timber. Design of structural elements in timber and timber connectors. Introduction to the complete design of industrial buldings in structural steel.

CVE414 - Engineering Hydraulics (2 Units)

Introduction to Civil Engineering hydraulics,.Fundamental properties of water, Open Channel Flow, Steady flow and Unsteady flow, Uniform flow conditions. Basic Equations of water flow: Continuity equation, Bernoulli Equation, Darcy – Weisbach Equation, Energy Equation, Chezy and

Manning Equations, Channel sections and Best hydraulic sections. Energy Principles in Open Channel Flow: Critical flow, hydraulic depth, Froude number. Hydraulic Jumps. Gradually and rapidly varied flow. Classifications of GVF. Types of Unsteady flow: Water hammer, Surge tanks, Flood waves and Tidal waves. Pipe flow: Laminar and turbulent flows in simple pipe systems, Energy head in Pipe Flow, Energy and Frictional losses, Pipe flow in series, pipe flow in parallel, Pipe network analysis. Hydraulic Structures Flow Measurements and Flow Control Structures. Water Pumps: Centrifugal pumps, Propeller (Axial-Flow) Pumps, Mixed-Flow Pumps. Performance Characteristics of pumps. Laboratory Experiments.

CVE415 - Highways and Transportation Engineering I (2 Units)
Introduction to Transportation Engineering: Role and Importance of Transportation, Models of Transportation, Airport plan, layout and location; Aircraft data and runway design. The permanent ways, turnouts and sidetracks; Locomotives, motive power, train resistance and velocity profile. Ports and harbours; Channel regulation; Coaster structures. Pipeline transportation, tramways and belt conveyors.

CVE416 - Laboratory Practicals and Design Studio III (2 Units)
Laboratory investigations and report submission on selected experiments and projects. Foundation engineering experiments. Laboratory test on, structural elements in concrete, timber and steel. Laboratory test on pavement materials.

CVE417 - Structural Analysis (2 Units)
Advanced moment distribution method, sway effects and modified stiffness methods for multi-bay and multi-storey structures. Ultimate load analysis. Model analysis. Matrix methods of analysis. Computer applications in structural analysis and design by the development and use of computer programs.

CVE418 - Engineering Economics (2 Units)
Economics of business settings. Costing of production systems. Objectives of cost analysis and control. Sources of finance, money and credit for projects. Investment appraisals. Resource allocation. Interest rates. Interest formulars and problems. Annual costs, present worth, Rates of return. Cost reducing. Depreciation accounting. Valuation of assets. Financial management; accounting methods, financial statement, elements of costing. Budget and budget control. Dwelling with multiple alternatives and uncertainties, Planning and decision making procedures. Macroeconomics, Economic growth. National income. Economics of technological change.

CVE419 - Surface and Ground Water Hydrology (2 Units)
The hydrologic cycle. Precipitation, infiltration, evaporation, groundwater, surface run-off, floods and droughts. Physical and statistical analysis related to hydrologic processes. Flood routing techniques. Hydrologic systems analysis, hydrogragraphs. Occurrence and distribution of water in nature. Fundamentals of flows in porous media. Equations governing flows in aquifer, exact and approximate solutions. Flows in layered aquifer systems.

500 Level

Alpha Semester

CVE510 - Water Resources Engineering (3 Units)
Introduction to typical issues related to catchments/stream complexes; rural and urban land uses and their potential water quantity and quality impacts. Elements of water resources and utilization. Hydraulics of open channels and wells. Drainage hydrograph analysis. Reservoir and floor routing. Hydrological forecasting. Hydraulic structures i.e dams, dykes/lakes. Weirs, docks and harbors, spillways, stilling basin, manholes and coastal, hydraulic structures etc. engineering economy in water resources planning. Water resources evaluation. Basic principles of water

quantity modeling and use of industry standard computer models. Water quality management options including improved land management, water demand management, planning frameworks and environmental and social impacts.

CVE530 - Geotechnical Engineering I (3 Units)
Stress – Strain relationships in soils; transformation of stresses and strains; Mohr's circle; Failure criteria: Mohr – Coulomb Failure theory; Shear strength and critical state analysis; Lateral Earth Pressure: stability and design of retaining walls, flexible bulkheads and braced excavations; Compressibility and consolidation of soils: Terzaghi theory and time rate of consolidation; Settlement analysis; General bearing capacity theory and application to deep foundations; Design of slopes: method of slices, stability charts and their use; Site investigations, and methods of subsurface exploration.

CVE512 - Structural Engineering (3 Units)
Plastic methods of structural analysis. Matrix methods of structural analysis. Elastic instability. Continuum of plane strain, elastic flat plates and torsion, solution by series, finite difference, finite elements, yield line analysis and strip method for slabs. Introduction to the plastic design concept for engineering practice, with particular reference to steel structures design; methods of plastic analysis from simple beams to complex frames. Introduction to Yield line theory for reinforced concrete slabs; Yield line solutions based on work equations. Lower bound solutions for reinforced concrete slabs using Hillerborg strip method.

CVE513 - Civil Engineering Seminar (2 Units)
Instruction of the preparation, presentation and discussion of critical reviews of topics and projects of importance to the engineering profession in general and civil engineering in particular. Oral preparation and presentation of technical essays and project reports by students. Invited lecturers on special topics in civil engineering.

CVE514 - Environmental Engineering Systems Design (2 Units)
Quantity: Population forecasting and per capita consumption, water requirements for domestic, public, commercial, industrial and agricultural purposes. Water distribution networks analysis design. Collection: rainwater from roofs, determination of storage capacity for small individual supplies, groundwater, transmission conduits. Treatment: Application of basic principles of sanitary engineering and hydraulics to the design of water distribution and wastewater treatment facilities. Flow diagrams for the treatment of surface and groundwater, preliminary treatment, screening, coagulation, flocculation and sedimentation. Slow sand, rapid sand and pressure filters. Disinfection, water softening, iron and manganese removal, chemical for water treatment. Distribution: Storage tanks and service reservoirs. Mains pipelines and distribution network. Valves, meters and services pipes. Pumps and pumping stations, laboratory and coursework. Methods of refuse disposal; wastewater disposals; solid waste; air pollution and control.

CVE515 - Transportation and Highway Systems (3 Units)
Highway planning and route location. Geometric design of highways: surface and sub-surface drainage and drainage structures. Pavement design for highways and airports: Flexible and rigid pavements: Introduction to highway construction and rehabilitation: Construction materials: semi-rigid pavement materials, stabilized soils, newer materials. Introduction to software application in highway design.

CVE516 - Laboratory Practicals and Design Studio IV (2 Units)
Laboratory investigations and report submission on selected experiments and projects drawn from foundation Engineering, Environmental Engineering, water resources management.

CVE517 - Engineering Systems and Design (2 Units)
Analysis and design of civil engineering projects from the view point of the whole. Interaction between the individual components (subsystems) and the effect of such on the overall system. Optimal operation of the

projects as measured by stability, ease of operation, and economic returns. Systems management (Operations research) techniques and applications in civil engineering modeling linear programming, dynamic programming. PERT, CPM in system management. Transportation problems. Queuing theory and application. Introduction to Auto-CAD detailing in structural elements.

CVE518 - Highways and Transportation Engineering II (2 Units)
Introduction to urban Transportation planning; the planning process. Planning models; Trip generation and distribution models. Growth factor models; Constant factor and average factor methods; Iteration process; directional and non-directional interchanges; Synthetic methods – Gravity models.

CVE519 - Student Project I (0 Units)
Taken in each of the final year semesters-total of 6 units. Final year students' individual or group projects in one of the several areas of civil engineering, under the supervision of the academic staff of the department or school. These independent projects may involve literature research, design elementary fabrication, construction or feasibility studies. A formal report of this required at the end of the year. Students may also be required to present their results orally before a panel of examiners.

CVE531 - Advanced Structural Engineering I (2 Units)
Feasibility study and planning of building and civil Engineering works and construction. Structural appraisal of Buildings. Design and detailing of structural engineering works-specifications. Modern structural forms and methods of construction. Design projects for complete structures will be assigned in groups or individually.

CVE532 - Tunnel Engineering (2 Units)
Geological processes: folding and faulting; geological map interpretation; mineral types and and engineering properties; Rock types and mechanics: engineering uses of rock; Principles of analysis and design for earth and rock tunnels: materials, construction methods, stability and

support systems, deformations and performance monitoring; Design of earth dams, earth reinforcement and geo-environmental structures; Choice and design of foundation; Subsurface investigation and measurement of soil in-situ properties.

Omega Semester

CVE520 - Environmental Engineering (3 Units)

Basic concept and theory. Design of solid waste collection and disposal systems. Field and laboratory sampling and monitoring of solid wastes. Analysis of municipal, industrial and agricultural solid wastes. Introduction to solid waste generation, collection, treatment and disposal. Sources of solid waste. Survey of industrial and domestic solid waste composition. Methods of collection of wastes generated in rural and urban communities. Industrial sewage collection systems. Treatment of wastes in the third world. Waste treatment plants. Types of septic tanks, Incineration and refuse farms. Pollution control methods and use of solid wastes in biogas and fertilizer production. Air pollution analysis. Inter-relationship between the disposal of solid, liquid and gaseous wastes and the pollution of air soil and water. Environmental modeling. Environmental impact assessment. Water quality characteristics and analysis. Water pollution abatement and control.

CVE521 - Traffic Engineering (2 Units)

The road traffic environment: Scope of traffic engineering; traffic characteristics; Traffic Engineering Studies: Volume, Traffic operation, intersections, traffic analysis and design, speed, parking, Accident, and Origin-Destination; Traffic flow theory; Capacity analysis; Traffic safety and legislation; Traffic control devices and design of traffic signals.

CVE522 - Building Technology (2 Units)

Construction planning and administration –cost control policies and procedures, incentives financial control. Network analysis. Arrow diagrams construction of a network, scheduling, time scales and project duration. Structure of the construction Industry. Design and construction teams, statutory authorities, approval processes, notice etc. pre- and post-contract planning: project evaluation, tendering, site organization and coordination, productivity and resource management, fast tracking etc. operations research. Application in construction management: linear programming, sentencing, queuing theory and work-study.

CVE523 - Design of Structures III (3 Units)
Plate theory- analysis of deformation in plates and shells. Continuum mechanics- force resolution in finite elements. Plastic method of structural analysis. Stress analysis in finite elements. Applications to composite design in steel and reinforced concrete with respect to structural form, tall buildings, lift shafts, shear walls, bridges and tunnels.

CVE524 - Engineering Management / Law (2 Units)
Management of engineering project environment. Formation of company, sources of finance, money and credit. Insurance, national policies, GNP growth rate and prediction. Organizational management. Management by objectives. Personnel management-selection, recruitment and training. Job evaluation. Industrial psychology-individual and group behaviour. The learning process and motivation factors. Resource management planning and decision-making. Forecasting scheduling. Production control. Gantt chart. CPM and PERT. Optimization methods. Transport and materials handling. Work study and production processes.

CVE525 - Design of Hydraulic Structures (2 Units)
Hydraulic models, hydraulic design criteria. Problems of reservoirs, rivers training and regulations, transition structures. Dams, weirs, spillways, gates and outlet works, stilling basin. Cofferdams, breakwaters, moldes, surge tanks. Design of municipal storm drains, land drainage system culverts and bridge. Design of drainage inlets, manholes and catch basins. Introduction to multiple purpose design involving flood control, water supply, irrigation, recreation, drainage, navigation a and erosion control.

CVE526 - Laboratory Practicals and Design Studio V (2 Units)
Composite design and construction in steel and reinforced concrete. Design of structural foundations. Prestressed concrete design. Modern structural form, tall buildings, lifts shafts and shear walls, system building. Design projects. Advanced methods for the design of structures, considering both loading and strength aspects of design. Strength and serviceability design of continuous post-tensioned concrete members; analysis of shear and torsion in prestressed concrete members, design and detailing of anchorage zones.

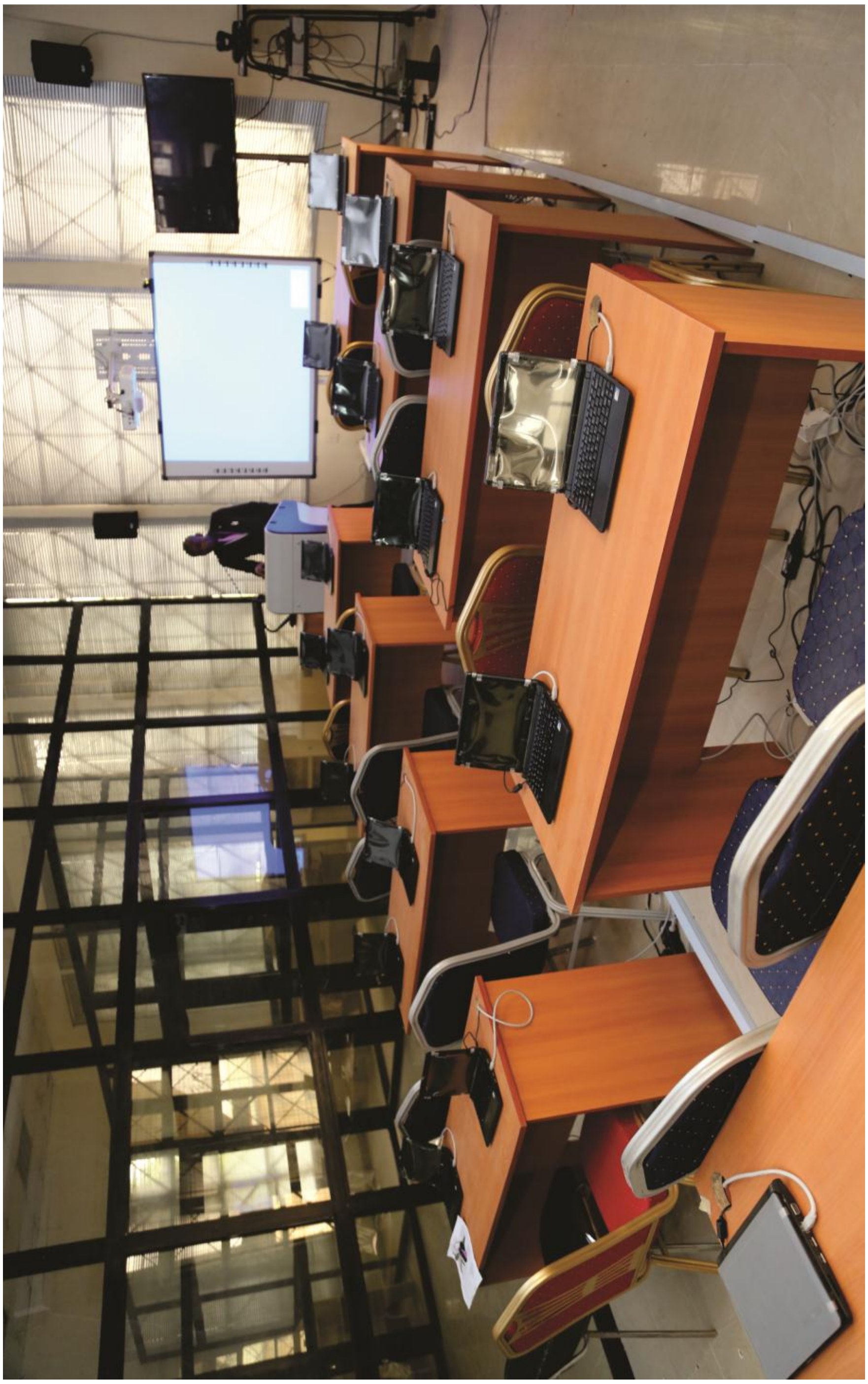
CVE528 - Transportation Systems Analysis and Design (2 Units)
Highway economics; benefit/cost ratio analysis of alternative schemes; Highway finance; Finance methods; Highway construction, maintenance and rehabilitation. Geotechnical issue related to performance; Source and types of aggregates; desirable properties of aggregates; Bituminous materials – bitumen, asphalts and tar; sources of asphalt; Paving grades of asphalts; desirable properties of asphalts mixtures; Laboratory tests for asphalts and asphalt mixtures; Asphalts mixture calculations and design; Marshall Mixture design procedure and criteria; Recycled asphalts materials- process, types, benefits; Introduction to *superpave* mixture design.

CVE529 - Student Project II (6 Units)
This is a continuation of CVE519.

CVE541 - Advanced Structural Engineering II (2 Units)
Superstructure and substructure design in reinforced concrete and steel structures for bridge design and multi-storey structures.

CVE542 - Geotechnical Engineering II (2 Units)
Bearing capacity factors for shallow and deep foundations; Generalised bearing capacity factors: footing under eccentric and inclined loads; Design, type and choice of foundations for different soil conditions , negative skin friction, pile groups, efficiency of pile groups; Earth Pressure: Equilibrium theories of Rankine and Coulomb: Geotechnical

Design of retaining structures; Analysis of slope stability including both theoretical and graphical solutions; Field measure of soil parameters.



e-Learning Facility at the CLR

Students working in EIE laboratory

A cross section of CU Students participating in EIE Conference

5.2 DEPARTMENT OF ELECTRICAL AND INFORMATION ENGINEERING

OVERVIEW OF THE DEPARTMENT

At the take-off of the College of Science and Technology on the 21st of October 2002, all the academic programmes were grouped into two Departments, namely:

1. Department of Computer and Information Technology
2. Department of Environmental Sciences

The Department of Computer and Information Technology started with the following Degree Programmes:

- B.Sc Computer Science (4 years)
- B.Sc Management & Information System (4 years)
- B.Eng Computer Engineering (5 years)
- B.Tech Information Technology (5 years)

The 5-year Degree Programme in Electrical and Electronics Engineering was introduced in the 2003/2004 academic session. At the beginning of the 2004/2005 academic session, more engineering programmes were introduced. These additions necessitated the re–grouping of the Programmes. This re-grouping gave birth to the Department of Electrical and Information Engineering.

The Department of Electrical and Information Engineering offers three Degree Programmes, namely:

- Bachelor of Engineering (B.Eng) in Computer Engineering
- Bachelor of Engineering (B.Eng) in Electrical and Electronics Engineering
- Bachelor of Engineering (B.Eng) in Information and Communication Engineering

The duration of each of the Degree Programmes in the Department is five (5) years or ten (10) semesters. Nine (9) semesters of coursework and laboratory practicals are spent in the University. The long vacation of eight (8) weeks between the 200 level and 300 levels is devoted to

Students' Work Experience Programme (SWEP) in the different works and production centres of the University (e.g., Wood mill, batching plant, metal fabrication workshop, bakery, Hebron Water, Dominion Press, CLMT, construction sites, etc.). At the 400 level, students embark on Students Industrial Experience Scheme (SIWES) which involves six months of industrial training, starting immediately after the Alpha Semester. As a result, the first three years, that is 100, 200, 300 levels, are 100% common to the three Programmes.

Justification for the Programmes in the Department

In the electro-mechanical age, Electrical Engineering as a discipline was monolithic and the name was adopted by universities offering the Programme. Then came the era of microelectronics which broadened the discipline to Electrical and Electronics Engineering. This made the Department of Electrical and Electronics Engineering to become common place. The computer age followed and it became fashionable to have a Department of Electrical and Computer Engineering. The new era is an Information age and in order to cope effectively with industry's labour demand, it becomes imperative to design programmes and curricula to meet this demand hence, the new nomenclature of Department of Electrical and Information Engineering and the Programmes offered in this Department.

Vision

The vision of the Department is derived from Covenant University's vision, which is succinctly captioned "Raising a New Generation of Leaders". Therefore, the Department is raising a new generation of leaders in Electrical and Information Engineering.

Philosophy

The Philosophy of the Department is derived from the departure philosophy of Covenant University. Electrical and Information Engineering as the backbone of a knowledge-based economy, is highly dynamic and versatile. Therefore, the Department's Programmes aim to contribute effectively to the knowledge-based economy by putting in place curricula that meet these challenges in Computer Engineering, Electrical and Electronics Engineering, and Information and Communication Engineering. The training is to produce graduates, who will be producers rather than mere consumers of knowledge and who, upon graduation, will be functional engineers in industries, research assistants, scholars in the academia, or successful entrepreneurs in the Electrical and Information Engineering sectors.

Objectives

The Department places emphasis on the following objectives:

i. to facilitate a good grasp of a broad spectrum of engineering principles by students;
ii. to facilitate the acquisition of practical work experience.
iii. to inculcate entrepreneurial, marketing, and management skills in students.
iv. to enable students to engage extensively in electrical and information engineering research and development.

ELECTRICAL AND INFORMATION ENGINEERING (EIE) EDUCATION TOWARDS MDGs AND VISION 20:2020

Electrical and Information Engineering is a scientific and engineering discipline encompassing the study and use of electrical phenomena. Various practical applications of electrical and information engineering can be divided into two major groups: application related to electric power and those connected to information. Electrical and Information Engineering is an interdisciplinary science closely related to the technical, natural and social sciences. There are few areas of human activity that have not been contributed to by the development of Electrical and Information Engineering. An ever-increasing need for electric power gives rise to the development of energy conversion appliances. Due to recent developments in electrical engineering, new ecologically acceptable energy sources are being discovered and power distribution systems improved. The evolution of microelectronics and computer technology brought about Information and Communication Technologies (ICTs) to become, economically, the most promising activities. Transmission of information via picture, voice or data is a fundamental prerequisite for the development of modern society. New computer technologies have significantly improved automatic control in the processing industry, ship handling, flying an aircraft, sophisticated robots and modern medical equipment. Well-educated professionals, capable of keeping abreast of the latest developments, are the fundamental prerequisite of quick and prestigious development. It is therefore only by excellent education that we can successfully keep pace with modern scientific achievements and with technological challenges.

The relevance of Electrical and Information Engineering in achieving the national goals, especially, the Millennium Development Goals (MDGs) and Vision 20: 2020 cannot be over emphasized:

- The Millennium Development Goals (MDGs): centres on poverty eradication and human capital development.
- Vision 2020: aims at becoming one of the 20 largest economies in the world by GDP and by that, the financial hub of Africa.

It is pertinent to note that sustainable, reliable, and affordable electric power and information services are indispensable to achieving these goals.

The Department of Electrical and Information Engineering offers courses in Computer Engineering, Electrical and Electronics Engineering, and Information Communication Engineering. These courses and the research projects are designed to train students to make original contributions and play leading roles in a global context. In all the Programmes, students are expected to be able to:

i. design electrical and information engineering projects and supervise their constructions;
ii. design and make electrical and electronic components, devices and systems;
iii. design and develop innovative products and production techniques in the electrical and information engineering industries;
iv. install and maintain electrical and information engineering systems for optimal performance in the local environment;

v. adapt and adopt exogenous technology in order to solve local engineering problems;
vi. investigate and develop systems according to specifications;
vii. function on multidisciplinary projects; and
viii. guide projects from specifications, through design, simulation, production, and testing.

Therefore, the Programmes are designed to provide the requisite human capacity in electrical and information industries which are essential to drive the government's development agenda. The Department is accordingly equipped and positioned to produce the manpower needed by the nation to attain the Millennium Development Goals (MDGs) and Vision 20: 2020, which are centred on poverty eradication and capacity building

Students in EIE Laboratory

LIST OF ACADEMIC STAFF IN THE DEPARTMENT

S/N	NAME	QUALIFICATION	STATUS	RESEARCH AREA
1.	Dr. F. E. Idachaba	B.Eng, M.Eng, Ph.D, MNSE, COREN	Senior Lecturer/ HOD	-Telecommunication & Electronics -Commuinication Infrastructure Design
2.	Prof. C. O. A. Awosope	B.Sc, M.Sc, Ph.D, FNSE, R.Engr (COREN)	Professor	Electrical Engineering
3.	Prof. S. T. Wara	B.Eng, M.Eng,Ph.D, R.Engr (COREN)	Professor	Power Engineering
4.	Prof. A.A.A. Atayero	B.Sc, M.Sc, Ph.D, IEEE, COREN	Professor	-Speech processing -Information Theory Analysis of languages -FPGA Implementation of D. Speech processing
5.	Prof. S. N. John	B.Sc, M.Sc, Ph.D, MNSE, R.Engr (COREN)	Professor	-Network efficiency, Management and VoIP -Computer Systems & Networking -Surveillance & Security System
6.	Dr. S. A. Daramola	B.Eng, M.Eng, Ph.D, MNSE, COREN	Associate Professor	- Image Processing-Biometrics
7.	Dr. V. O. Mathews	B.Sc, M.Sc, Ph.D	Senior Lecturer	-Mobile Communications -Satellite Tracking Systems -Surveillance &Security -Wireless Networks
8.	Dr. O. E. Agboje	B.Sc, M.Sc, Ph.D, Dipl.Ing, VDI	Senior Lecturer	- Rural Communication Network - Virtual Laboratory Research of ICT Education - Line-Extension Network
9.	Dr. C. U. Ndujiuba	B.Eng, M.Eng, Ph.D, MNSE, COREN	Senior Lecturer	-Microwave System &Devices -Optic Fibre -Digital Signal Processing -Radio Frequency Propagation
10.	Dr. A. U. Adoghe	B.Eng, M.Eng, Ph.D, R. Eng (COREN), MNSE, MIEEE	Senior Lecturer	-Power System Maintenance Planning, asset management and reliability central maintenance methods. -Reliability Modeling for electrical components & protections
11.	Dr. E. Adetiba	B.Eng, M.Eng, MNSE, MIEEE, R.Engr. (COREN)	Senior Lecturer	Software Defined Radio (SDR) Wireless in Communications -Health Informatics
12.	Dr. M. Eyinagho	B.Sc, M.Sc, MBA, Ph.D, MNSE, MNCS, R.Eng (COREN)	Lecturer I	Microprocessor System Applications, Data Network Optimization
13.	Dr. A. F. Agbetuyi	B.Eng. M.Eng, Ph.D, MNSE, R. Eng (COREN)	Lecturer I	-Distributed Generation. -Power system stability

				-Protection and control.
14.	Engr. O. S. James	M.Sc. R.Eng (COREN), FNSE, MNIM	Lecturer I	- Renewable Energy - Design of Electrical Machines
15.	Engr. I. A. Samuel	M.Eng, PGDEE, R.Engr. (COREN), MNSE	Lecturer I	-Power system operation and maintenance, Reliability -Renewable Energy.
16.	Engr. A. A. Adewale	B.Sc, M.Sc, MNSE, R.Engr. (COREN)	Lecturer I	-Communication/ICT. -Wireless (N/W) security. -N/W optimization.
17.	Engr. A. A. Awelewa	B.Eng, M.Eng, MNSE, MIEEE	Lecturer I	-Modeling & Control of systems -Power system stability & Control
18.	Engr. A. Abdulkareem	B.Eng, M.Sc, MNSE, R.Engr. (COREN)	Lecturer I	- Power systems and High Voltage Engineering
19.	Engr. H. E Orovwode	B.Eng, M.Eng, Ph.D, MNSE,R.Eng (COREN)	Lecturer II	-Energy Conervation and optimization.
20.	Engr. J. O. Olowoleni	B.Sc, M.Sc, MNSE, COREN	Lecturer II	-Power system stability control -Renewable Energy.
21.	Engr. (Mrs) J. A. Badejo	B.Eng, M.Eng, MNSE, MIEEE, COREN	Lecturer II	Digital Signal Processing with emphasis on Image Processing and Speech Recognition.
22.	Engr. L.O. Idoko	B.Eng, M.Sc, MNSE, R.Engr. (COREN)	Lecturer II	Electrical Power
23.	Engr. A. A. Adelakun	B. Tech, M.Eng, COREN	Lecturer II	-ICT Broadcasting wireless network
24.	Mr. T. O. Majekodunmi	B. Eng, M.Eng	Assistant Lecturer	-Computer Networks and Embedded systems
25.	S. A. Alatishe	B. Eng, M.Eng	Assistant Lecturer	-ICT Broadcasting wireless network
26.	Mrs. T. O. Takpor	B.Sc, M.Sc	Assistant Lecturer	Communications Engineering
27.	Mrs. O. D. Oshin	B.Eng, M.Eng	Assistant Lecturer	Communications Engineering
28.	Mrs. T. O. Odu	B.Eng, M.Eng	Assistant Lecturer	Biometrics, Iris Recognition
29.	Mr. N. S. Nkordeh	B.Eng, M.Eng	Assistant Lecturer	Antennae and Microwave Measurement
30.	Mrs. O. O. Oni	B.Eng, M.Eng	Assistant Lecturer	Communication Engineering
31.	Mrs. C. Etukudor	B.Eng, M.Eng	Assistant Lecturer	Renewable Energy
32.	Mr. F. Olowononi	B.Eng, M.Eng	Assistant Lecturer	Communication Engineering
33.	Miss O. O. Ayo	B.Eng, M.Eng	Assistant Lecturer	Electrical Electronics Engineering
34.	Mr. P. A. Amaize	B.Eng, M.Eng	Assistant Lecturer	Electrical Electronics Engineering
35.	Mr. P. O. Iyamu	B.Eng, M.Eng	Assistant Lecturer	Communication Engineering

VISITING LECTURERS

S/N	NAME	QUALIFICATION	STATUS	RESEARCH AREA
1.	Dr. R. E. Okonigene	B.Eng, M.Eng, Ph.D	Professor	Communication Engineering
2.	Dr. Michael Adebayo Omidiora	B.Eng., M.Eng, Ph.D	Senior Lecturer	Power Engineering

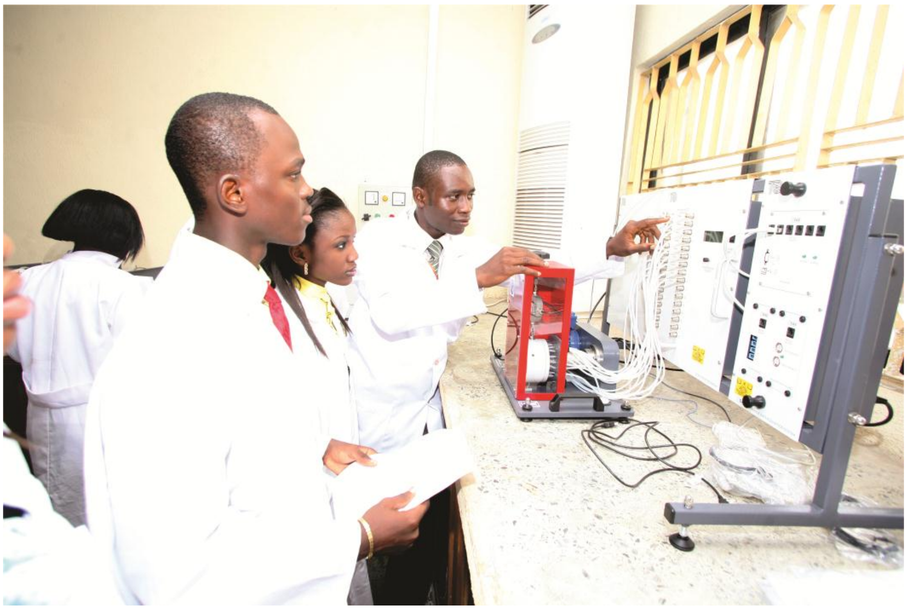
LABORATORY STAFF

S/N	NAME	QUALIFICATION	STATUS
1.	R.S. Adesuyi	B.Eng	Assistant Chief Technologist
2.	M.A. Daramola	HND (Elect/Elect)	Technologist I
3.	G.A. Afolabi	HND (Elect/Elect)	Technologist I
4.	A. Ifijeh	B.Eng (Elect/Elect)	Technologist I
5.	K.A. Adeyeye	HND	Technologist I
6.	J.O. Odetola	HND	Technologist I
7.	A.G. James	HND	Technologist I
8.	R. A. Olomo	HND	Technologist I
9.	L. S. Raheem	HND	Technologist I
10.	O. S. Ajiboye	HND	Technologist II
11.	K. Moses	HND (Elect/Elect)	Technologist II
12.	A. A. Adebiyi	HND (Elect/Elect)	Technologist II
13.	M.O.C. Banjo	ND (Elect/Elect)	Senior Assistant Technologist
14.	A.E. Akindele	SSCE	Senior Laboratory Attendant
15.	O. Akinsomi	SSCE	Laboratory Attendant

ADMINISTRATIVE STAFF

S/N	NAME	QUALIFICATION	STATUS
1.	Mr. V. Ituen	B.Sc	Administrative Officer
2.	Mr. O. Oladeinde	B.Sc	Administrative Officer

Students working in EIE Laboratory



Students under supervision of Lab Technician in one of the EIE Laboratories

Students working with some of the teaching and research equipments in one of the EIE Laboratories

5.2.1 COMPUTER ENGINEERING PROGRAMME

PROGRAMME: Computer Engineering

DEGREE AWARDED: B.Eng Computer Engineering

DURATION: Five (5) Years (10 Semesters)

ADMISSION REQUIREMENTS

The minimum entry requirement for admission into the Department of Electrical & Information Engineering Undergraduate Programmes is O'Level SSCE/GCE/ NECO Credit level passes in five (5) subjects, including English and Mathematics, Physics, Chemistry, and either credit pass in Further Mathematics, Biology, or Technical Drawing. Candidates are also expected to sit for the Unified Tertiary Matriculation Examination (UTME) and attain the prescribed cut-off marks, in addition to passing the Covenant University Scholastic Aptitude Screening (CUSAS).

GRADUATION REQUIREMENTS

To graduate from the 5-year Bachelor of Engineering (B.Eng) Degree Programme in Computer Engineering, students must have successfully completed a minimum of 215 Credit Units as shown:

Graduation Required Units for B.Eng Computer Engineering Programme

Level	Core/ Compulsory	Electives	SWEP	Industrial Training (SIWES)	College Courses	University Courses	NUC Courses	Total
100	31					4	10	45
200	38		0			4	6	48
300	43					4	2	49
400	21			6		2		29
500	36	4				4		44
Total	169	4	0	6	0	18	18	215

COURSE STRUCTURE

100 Level Computer Engineering

Course Grouping	Course Code	Course Title	Status	Unit	Pre-requisite	Semester
Compulsory Courses	GEC117	Technical Drawing	C	2		α
	MAT111	Mathematics I: Algebra	C	3		α
	MAT112	Mathematics II: Trigonometry and Geometry	C	2		α
	PHY111	Mechanics and Properties of Matter	C	2		α
	PHY112	Heat, Sound and Optics	C	2		α
	PHY119	Physics Practicals IA	C	1		α
	CHM111	General Physical Chemistry	C	3		α
	CHM119	General Chemistry Practical I	C	1		α
	MAT121	Mathematics V: Calculus	C	3		Ω
	MAT122	Mathematics VI: Vector Algebra	C	2		Ω
	PHY121	Electricity and Magnetism I	C	2		Ω
	PHY122	Atomic and Nuclear Physics	C	2		Ω
	PHY129	Physics Practicals IB	C	1		Ω
	CHM121	General Organic Chemistry	C	2		Ω
	CHM122	General Inorganic Chemistry	C	2		Ω
	CHM129	General Chemistry Practical II	C	1		Ω
University Courses	EDS111	Entrepreneurial Development Studies I	V	1		α
	TMC111	Total Man Concept I	V	1		α
	TMC112	Total Man Concept - Sports	V	0		α
	EDS121	Entrepreneurial Development Studies II	V	1		Ω
	TMC121	Total Man Concept II	V	1		Ω
	TMC122	Total Man Concept – Sports	V	0		Ω
NUC General Courses	CST111	Use of Library, Study Skills and Information Communication Technology I	U	2		α
	GST111	Communication in English	U	2		α
	CST121	Use of Library, Study Skills and Information Communication Technology II	U	2		Ω
	GST121	Use of Library Study Skills and ICT	U	2		Ω
	GST 122	Communication In French	U	2		Ω
				α =22 Ω = 23 Total = 45 Units		

200 Level Computer Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC210	Engineering Mathematics I	C	2	MAT122, MAT123	α
	GEC211	Introduction to Electrical Engineering 1	C	2		α
	GEC212	Engineering Graphics	C	2		α
	GEC213	Material Science and Raw Materials Studies	C	2		α
	GEC214	Applied Mechanics	C	3		α
	GEC215	Applied Computer Programming I	C	2	CST121	α
	GEC216	General Engineering Laboratory I	C	3		α
	GEC217	Engineer-in-Society I	C	1		α
	GEC218	Workshop Technology	C	2		α
	GEC220	Engineering Mathematics II	C	2		Ω
	GEC221	Thermodynamics	C	2		Ω
	GEC222	Computer Aided Design and Manufacture	C	2		Ω
	GEC223	Fluid Mechanics	C	2		Ω
	GEC224	Strength of Material	C	2		Ω
	GEC225	Applied Computer Programming II	C	2		Ω
	GEC226	General Engineering Laboratory II	C	3		Ω
	GEC227	Electrical Measurements and Instrumentations	C	2		Ω
	GEC228	Introduction to Electrical Engineering II	C	2		Ω
SWEP	GEC229*	Student Workshop Experience Programme (SWEP)	S	0		Ω
University Courses	EDS211	Entrepreneurial Development Studies III	V	1		α
	TMC211	Total Man Concept III	V	1		α
	TMC212	Total Man Concept – Sports	V	0		α
	EDS221	Entrepreneurial Development Studies IV	V	1		Ω
	TMC221	Total Man Concept IV	V	1		Ω
	TMC222	Total Man Concept – Sports	V	0		Ω
NUC General Courses	GST211	Logic, Philosophy and Human Existence	U	2		α
	GST221	Nigerian People and Culture	U	2		Ω
	GST222	Peace Studies and Conflict Resolution	U	2		Ω
			α =23 Ω = 25, Total = 48 Units			

***NOTE:** GEC229 (SWEP) is done during long vacation

300 Level Computer Engineering						
Course Grouping	Course Code	Course Title	Status	Unit	Pre-requisite	Semester
Compulsory Courses	GEC310	Engineering Mathematics III	C	3	GEC220	α
	EIE311	Electromagnetic Fields and Waves	C	3		α
	EIE312	Communication Principles	C	3		α
	EIE313	Physical Electronics	C	2	GEC228	α
	EIE314	Electric Circuit Theory I	C	3	GEC228	α
	EIE315	Electrical Machines I	C	3	GEC228	α
	EIE318	Laboratory Course I	C	3		α
	GEC320	Numerical Methods	C	2	GEC310	Ω
	EIE322	Signal and Systems	C	2		Ω
	GEC324	Technical Communications	C	1		Ω
	EIE321	Introduction to Power Systems	C	2	EIE315	Ω
	EIE323	Analogue Electronics	C	3	EIE313	Ω
	EIE324	Electric Circuit Theory II	C	3	EIE314	Ω
	EIE325	Use of Engineering Packages	C	1		Ω
	EIE326	Software Development Techniques	C	2	GEC225	Ω
	EIE327	Digital Electronics	C	3		Ω
	GEC321	Engineer-in-Society II	C	1		Ω
	EIE328	Laboratory Course II	C	3		Ω
University Courses	EDS311	Entrepreneurial Development Studies V	V	1		α
	TMC311	Total Man Concept V	V	1		α
	TMC312	Total Man Concept – Sports	V	0		α
	EDS321	Entrepreneurial Development Studies VI	V	1		Ω
	TMC321	Total Man Concept VI	V	1		Ω
	TMC322	Total Man Concept – Sports	V	0		Ω
NUC General Course	GST311	History and Philosophy of Science	U	2		α
			α =24 Ω 25 = Total = 49 Units			

400 Level Computer Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Unit**	**Pre-requisite**	**Semester**
Compulsory Courses	GEC410	Probability and Statistics	C	2	GEC220	α
	EIE411	Computer Organization and Architecture	C	3		α
	EIE412	Control Systems	C	3		α
	EIE413	Laboratory Course and Mini Project	C	1	GEC228	α
	EIE414	Design and Installation of Electrical and ICT Services	C	2	GEC228	α
	CEN414	Object Oriented Design and Programming	C	3	GEC228	α
	CEN416	Assembly Language Programming	C	2		α
	CEN417	Prototyping Techniques	C	2	GEC310	α
	EIE418	Data Communications and Computer Networks	C	3		α
SIWES [Industrial Training]	GEC429	Student Industrial Work Experience scheme (SIWES) [Industrial Training]	S	6		Ω
University Courses	EDS411	Entrepreneurial Development Studies VII	V	1		α
	TMC411	Total Man Concept VII	V	1		α
	TMC412	Total Man Concept – Sports	V	0		α
			α =23 Ω = 6 Total = 29 Units			

500 Level Computer Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	EIE510	Research Methodology	C	1		α
	EIE511	Project Management	C	2		α
	EIE512	Systems Reliability and Maintainability	C	2		α
	EIE513	Cyberpreneurship and Cyber law	C	2		α
	EIE515	Digital Signal Processing	C	3		α
	CEN510	Digital System Design with VHDL	C	3		α
	CEN511	Embedded System Design and Programming	C	3		α
	EIE517	Applied Electronics	C	2		α
	EIE519	Project I	C	0		α
	CEN520	Robotics and Automation	C	2	EIE315	Ω
	CEN521	Software Engineering	C	2	EIE313	Ω
	CEN522	Microprocessor System and Interfacing	C	3	EIE314	Ω
	CEN523	Computer Networking and Security	C	3		Ω
	EIE528	Digital Control Systems	C	2	GEC225	Ω
	*EIE529	Project II	C	6		Ω
Electives	*__Note:__ Select **at least 4 Credits Units** from the following Electives*					
	EIE520	Artificial Neural Network	E	2		Ω
	EIE521	Electromagnetic Interferences	E	2		Ω
	EIE524	Cryptography Principles and Applications	E	2		Ω
	EIE525	Fuzzy Logic and Programming	E	2		Ω
	EIE526	Digital Image Processing	E	2		Ω
	CEN525	Computer Graphics	E	2		Ω
	EEE529	Introduction to Mechatronics	E	2		Ω
University Courses	EDS511	Entrepreneurial Development Studies IX	V	1		α
	TMC511	Total Man Concept IX	V	1		α
	TMC512	Total Man Concept – Sports	V	0		α
	EDS521	Entrepreneurial Development Studies X	V	1		Ω
	TMC521	Total Man Concept X	V	1		Ω
	TMC522	Total Man Concept – Sports	V	0		Ω
			α =20 Ω = 24 Total = 44 Units			

**EIE529 (Project II) is a continuation of EIE519*

COURSE DESCRIPTION FOR COMPUTER ENGINEERING

100 Level

Alpha Semester

GEC117 - Technical Drawing (2 Units)

Drawing Tools: Description, Uses and Maintenance, Line Work: Definition of points, lines and planes, Types of lines (Description, Uses), Dimensioning: Examples like arrow heads, solid dots and crosses; of straight lines, of circles, inadequate space dimensioning, Common Errors in line drawings, Lettering, Drawing Sheets Format, Border Lines and Title Block. Plane Geometry: Angles (Types and their construction), Triangles (Types and their construction), Quadrilaterals (Types and their construction), Polygons (Types and their construction), Circle and It's Parts, Inscribing and Circumscribing Circles, Tangents (Internal and External), Ellipse (Different Methods of construction), Plane and Diagonal Scales. Orthographic Projection: Basic Introduction: Description, Plan, Elevations, 1st Angle Projection, 3rd Angle Projection, Sectioning, Exercises.

MAT111 - Mathematics 1: Algebra (3 Units)

Algebra of Sets; special sets (NCZCRCC); theory of indices, law of logarithms, indical equations, surdic equations. Polynomials, the remainder and factor theorems; polynomial equations and inequalities-especially linear, quadratic and `cubic. Solving quadratic equation and cubic equations with an integral root. Domain and zeroes of rational functions. Partial fractions. Permutations and combinations. The binomial theorem for any index and applications. Sequences and series of real numbers (including AP and GP). Algebra of complex numbers. Introduction to m x n matrices; elementary operations on matrices and applications to solution of linear equations. Elementary properties of determinants of at most 3 x 3 matrices; The Rule of Sarrus.

MAT112 - Mathematics II: Trigonometry and Analytical Geometry (2 Units)

Trigonometric functions; exponential and logarithmic functions. Circular measure; hyperbolic functions. Equations of lines and planes; conic sections (circle, parabola, hyperbola, ellipse).

PHY111 - Mechanics and Properties of Matter (2 Units)

Units and dimensions, scalars and vectors, particle kinematics, Newton's laws, friction, work, energy, centre of mass, simple harmonic motion, rigid body dynamics, kepler's laws, pressure in fluids, intermolecular forces, Hooke's law, Young's modulus, fluid flow streamline turbulence, stroke's law, surface tension.

PHY112 - Heat, Sound and Optics (2 Units)

Temperature, thermometers, heat transfer, PVT –surfaces, Kinetic theory, first and second laws of thermodynamic, transverse and longitudinal waves, standing waves, intensity, beats. Doppler Effect, Electromagnetic spectrum. Huygen's principle, images formed by a single surface thin lenses, aberrations, the eye, optical instruments, interface, single slit, diffraction grating, polarization, elementary examples.

PHY119 - Physics Practical IA (1 Unit)

Simple experiments illustrating the topics covered in PHY111 and PHY112.
A selection from the following experiments use of measuring instruments, viscosity, surface tension oscillations about an equilibrium position, Hooke's law, moment of inertia, focal lengths of lenses, refractive index, optical instruments, the sonometer heat capacity, volume expansion and latent heat.

CHM111 - General Physical Chemistry (3 Units)

Historical development of the atom: atoms, Dalton's atomic theory, atomic masses. Fundamental particles of the atom atomic structure. Modern electronic theory of atoms. Periodicity of the elements. Stoichiometry mole concept, chemical formulas, equations and calculations. State of matter; gas, liquid and solid. Chemical energetics and thermochemistry. Chemical kinetics, equilibria and electrochemistry.

CM119 - General Chemistry Practical 1 (1 Unit)

Practice in weighing and measurement of volume, preparations of standard solutions. Titrimetry: acid-base, oxidation-reduction, precipitation and complex metric titrations; gravimetric analysis.

Omega Semester

PHY121 - Electricity and Magnetism I (2 Units)

Coulomb's law, Ohm's law, Gauss' Law, capacitors, Ohm's law, Kirchoff's laws, Electrical energy, DC bridges, potentiometer, magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometers, multi-meters, DC and AC motors and generators, power in AC circuits, semiconductors, conductivity and mobility, rectification.

PHY122 - Atomic and Nuclear Physics (2 Units)

Theory of atomic structure., Thompson, Rutherford and Bohr's theories, the hydrogen atom, properties of the electron, e/m, CRO, Millikan's experiment, properties of the nucleus, natural radioactivity, wave particle duality of light, x-rays, photo electricity , thermionic emission, diode valve.

PHY129 - Physics Practical IB (1 Unit)

A selection from the following experiments, potential difference and internal resistance of cells, uses of potentiometer circuit, the meter bridge, simple direct current measuring instruments, Planck's constant, radioactivity.

MAT121 - Mathematics V: Calculus (3 Units)

Functions of Real Variables: Graph, Limits and Concepts of Continuity. Techniques of Differentiation of Algebraic and Trigonometric Functions, Higher Order Derivates, Maxima and Minimal, Leibnitz Rule, Application of Differentiation. Integration as Inverse of Differentiation, Methods of Integration, Definite Integra. Application to Areas, Volumes,

Moment of Inertial. Approximate Integration: Trapezoidal and Simpson's Rule. Taylor's and Mclaurin's Theorems, Partial Differentiation and Implicit Differentiation.

MAT122 - Mathematics VI: Vector Algebra (2 Units)

3-Dimensional Cartesian Coordinate Systems. Definition and Representation of Vectors, Algebra of Vectors, Multiplication of a Vector by a Scalar, Addition of Vectors, Scalar Products of two Vectors, Direction Cosines, Calculus of Vector Functions, Differentiation of Vector Function, Integration of Vector Function. Conic: Circles, Parabola, Ellipse and Hyperbola.

CHM121 - General Organic Chemistry (2 Units)

Introduction to and importance of organic chemistry. Qualitative analysis of organic compounds. Isolation and purification of organic compounds. Quantitative analysis of organic compounds. Determination of structure of organic compounds; empirical, molecular and structural formulas. Hybridization; of sp^3, sp^2, sp orbital in carbon. Homologous series and functional groups. Isomerism-structural and stereoisomerism. Aliphatic hydrocarbon chemistry: alkenes, alkynes-nomenclature (IUPAC), physical properties, preparation and chemical reactions with simple mechanism where applicable.

CHM 122 - General Inorganic Chemistry (2 Units)

Chemical bonding and structure: ionic, covalent, coordinate covalent (dative), metallic, hydrogen bonding. General properties of compounds formed by the different types of bonding. Influence of bonding on size, shape and structure. Main Group Chemistry (Groups IA – VIIIA): trends in the properties of elements (structure, ionization energies, physical and chemical properties). Properties of selected types of compounds.

CHM129 - General Chemistry Practical II (1 Unit)

Qualitative analysis for common captions and anions. Identification of organic functional groups: hydroxyl, carbonyl, carboxylic, amino groups, sugar, carbohydrate, protein, etc.

200 Level

Alpha Semester

GEC210 - Engineering Mathematics I (2 Units)

Functions, inverse trigonometric functions and principal values, hyperbolic & its inverse, graphs. Concepts of continuity and differentiability. Mean-value theorem. Taylor's series expansion. Integration by parts. Sequences: real numbers, monotone, convergence, limits. Infinite series: convergence tests, addition, multiplication. Power series, radius of convergence, integration, differentiation. Real and imaginary parts, the complex plane, terminology and notation. Complex algebra, DeMoivre's theorem, powers and roots of complex numbers. Euler formula. Elementary functions of a complex variable, polynomials, rational, exponential, trigonometric, hyperbolic, logarithmic, inverse trigonometric and inverse hyperbolic functions.Vectors in R^n space, addition and scalar multiplication, linear combination of vectors, idea of linear dependence and independence. Dot and cross products, triple products, lines and planes.

GEC211 – Introduction to Electrical Engineering 1 (2 Units)

Overview of electrical engineering: meaning and description; devices and systems. Brief introduction to electric power system components: generation, transmission, distribution and loading. Basic electric circuit analysis: circuit quantities (voltage, charge and current, power and energy); circuit elements (resistors, capacitors, inductors); basic laws and theorems (ohm's law, voltage divider and current divider rules, star-delta transformations, Kirchoff's laws); AC circuits (sinusoids, phasors and phasor diagrams for circuit elements and their combinations, impedance and admittance, frequency response of RLC circuits, and resonance); power analysis (instantaneous and average power, power triangle, and power factor). Introduction to electrical transformers and machines: fundamentals of magnetic circuits; transformers (principle of operation, ideal and real properties, types and applications); DC and AC machines (constructional features and principles of operation of dc and ac generators and motors, and applications). Introduction to OP Amps: ideal OP Amp, inverting and non-inverting amplifiers, summing amplifiers, difference amplifiers, cascaded op amp circuits and applications. Introduction to computer and digital systems: digital building blocks (logic circuits, combinatorial and sequential circuits); fundamentals of computer systems and networks. Introductory communications and control systems: communication systems (description, components, types and examples); control systems (description, components, types and examples).

GEC212 - Engineering Graphics (2 Units)

Lettering, linework, dimensioning, orthographic projection, sectioning, isometric and oblique pictorial views. Graphical calculus, Architectural Drawing, electrical and communication, and IT symbols and drawing.

GEC213 - Materials Science and Raw Materials Study (2 Units)

Raw material deposit survey in Nigeria: quantity, location. Processing techniques, and existing processed products. Material characteristics, and composition. Material re-cycling. Physics of materials. Chemistry of materials.

GEC214 - Applied Mechanics (3 Units)

Forces, moments, couples. Equilibrium of simple structures. First and second moments of area; centroids. Kinematics of rigid bodies in plane motion. Applications of Newton's laws of motion. Kinetic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature. The stress circle, deflection, deflection of beams. Shear forces and bending moments, analytical and graphical methods for structures. Design and analysis of communication towers, standards, and regulations.

GEC215 - Applied Computer Programming I (2 Units)

Software development life cycle (SDLC). Definitions, SDLC models: Waterfall model, V - shaped model, Incremental model, Spiral model. Program design: Algorithms: Key features of algorithms and different ways of presenting algorithms. Flow charting of algorithm. Pseudocode:

Pseudocode statements for input, output, iteration, decision, and processing, Arithmetic, relational and logical operations on Pseudocode, use of sub – process in Pseudocode. Introduction to QBASIC programming: Symbols, keywords, identifiers, data types, operators, control structure, functions, procedures. Array:: 1-D, and multi-dimensional arrays. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, random access files.

GEC216 - General Engineering Laboratory 1 (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to Electrical Engineering, Materials Science, Applied Mechanics, Applied Computer Programming I and Workshop Technology Courses.

GEC217 - Engineer-In-Society I (1 Unit)

Science, Technology and Development: Ethical concepts of development. Indicators of development, and the role of science and technology. The contribution of the Government to the process of development and the Nigerian experience in the process of economic development (Nigerian Five Year Development Plans, successes and setbacks). Limits of growth, appropriate technology and a new world of science and technology. Science, Technology and Society: The inter-relationship of social ethics and values, and science and technology. Societal needs and resources in the genesis and development of science and technology. Social problems, impact assessment, and control of science and technology. Responsibilities of engineers. Science, Technology and Environment: Disruption or enhancement of environmental quality through harmful or sound science and technology in relation to air, space, water, land, populations, agriculture, industry, wild life, human settlements, culture, education, etc. Ethics and Professionalism: Theistic and secular concepts of personal, social and professional ethics. Codes of conduct of engineers. Motivation, control, responsibility, rewards and accountability of engineers and development of an ethical engineering professionalism. Council of Engineers and Engineering Societies.

GEC218 - Workshop Technology (2 Units)

Introduction to engineering workshop practice covering mechanical, electrical, information engineering, civil, chemical, and petroleum engineering. Use of hand tools, and safety measures in these fields.

Omega Semester

GEC220 - Engineering Mathematics II (2 Units)

Partial Differentiation: Functions of several variables, continuity and partial derivatives. Total differentials, approximate calculations using differentials. Chain rule. Implicit differentiation. Series representation of functions, (Maclaurin's and Taylor's) Taylor's Theorem. Extremum problems, without and with constraints, Lagrange multipliers, global extremum. Ordinary Differential Equations: Definition, degree, order, linear, non-linear, solution. First order equations, separable variables, equations reducible to separable form, exact equations, integrating factors, linear equations. Linear differential equations with constant coefficients, homogeneous, non-homogeneous, complementary functions, particular integrals, D-operator method. General linear second-order differential equations (without using matrices).Power series solution, Legendre's differential equation.

GEC221 – Thermodynamics (2 Units)

Basic concepts, quantitative relations of zeroth, first, second and third laws of thermodynamics. Behaviour of pure substances and perfect gases. Ideal gas cycles.

GEC222 - Computer Aided Design and Manufacture (2 Units)

AutoCAD: principle and use of autocad. Electronic drafting and use of autocad in electrical, electronic, computer & communication engineering design. System's manual writing, component assembly instruction manual preparation. Oral Communication: Public speaking skills with effective use of visual aids and statistical and technical information. Principles of effective communication in interpersonal and mass communication

process. Effective reading skills-extracting main ideas and reading for specific information through speed reading. Written Communication: Principles of technical writing.

GEC223 - Fluid Mechanics (2 Units)

Properties of fluids. Fluid statics. Density, pressure, surface tension, viscosity, compressibility, etc. Basic conservation laws, friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamics similitude, principles of construction and operation of selected hydraulic machinery. Hydropower systems.

GEC224 - Strength of Materials (2 Units)

Forces, moments. Equilibrium of simple structures and machine parts. Kinematics of particles and rigid bodies. Newton's laws. Kinetic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature change. Stress circle. Deflection of beams. Shear forces and bending moments. Analytical and graphical methods for structures.

GEC225 - Applied Computer Programming II (2 Units)

Review of QBASIC and Introduction of Visual BASIC, Comparison of QBASIC and VBASIC. Creating applications. VBASIC Integrated Development Environment. Menu Design, Use of Procedures, Functions, Subroutines, and Event Procedures. Opening and Saving Pictures to folders. Writing to and Reading from files e.g. Notepad, MsWord. Writing to and Reading from Database e.g. Access. Writing to and Reading from Text and database over the NET, Printing. Multimedia with VB: Sound, Music, and Video, Animation with VB. Calling other Applications from VB (Shell execute), html, pdf, .doc, files.

GEC226 - General Engineering Laboratory II (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to electrical Engineering, Materials science, Applied Mechanics, Applied Computer Programming I and Workshop Technology courses.

GEC227 - Electrical Measurements and Instrumentations (2 Units)

Instrument systems including transducers, signal conditioners, and read out devices. Oscilloscope, recorders, bridges. Measurement of voltage, current, resistance, impedance, frequency, phase difference, electric power, energy, force, displacement, temperature, flow, pressure, and other engineering parameters.

GEC228 - Introduction to Electrical Engineering II (2 Units)

Analysis of Magnetic circuits, Hysteresis and eddy currents, three phase circuits, three-phase power measurement, Transformer theory; short-circuit and open-circuit tests, voltage regulation, efficiency. Electrical machines; constructional features and operation of dc generators and motors; single-phase and 3-phase motors and generators, electric energy utilization for lighting and heating. Tariffs.

GEC229 - Student Work Experience Programme (SWEP) (0 Unit)

Introduction to practices and skills through supervised hands-on workshop exercises in computer engineering and information & communication technology, and related general engineering. These exercises include familiarisation with basic tools, soldering and desoldering skill of pass-through & surface mount components, building of simple electronic circuits, troubleshooting of electronic devices, digital systems, etc. Use of hand drill. Safety precautions in handling electronics devices. Basic welding skill.

300 Level

Alpha Semester

GEC310 - Engineering Mathematics III (3 Units)

Matrices and Determinants: Matrices, some special matrices, matrix operations. Determinants and some useful theorems. Laplace's development. Solution of system of linear equations by determinants. Linear dependence and independence, rank of a matrix. General system of linear equations, existence and properties of solution, Gaussian elimination. Matrix inverse by elementary matrices, adjoint, and partitioning methods. Characteristic polynomial, characteristic equation, eigenvalues and eigenvectors. Diagonalization of matrices, application to system of first order linear differential equations. Multiple Integrals:Iterated integrals, multiple integrals over elementary regions. Change of variables, Jacobians. Differentiation of integrals involving a parameter, Leibniz's rule. Vector Algebra: Vector field, gradient and directional derivative, divergence, curl. Line and surface integrals, Stoke's theorem. Volume integrals, divergence theorem. Orthogonal transformations, scale factors, basis vectors. Cylindrical and spherical polar coordinate systems, gradient, divergence and curl in these systems. Fourier Series: periodic functions, trigonometric series. Fourier coefficients, Parsevals theorem, Functions of arbitrary period, even and odd functions. Half range expansion. Complex form of Fourier series. Integral Transform: Derivation of transforms and inverses (Fourier and Laplace). Applications of these transforms in boundary and initial value problems. Z transforms. Partial Differential Equations: Elementary properties of Gamma, Beta, Error, Bessel functions and Legendre polynomials. Basic concepts of partial differential equations. Classification of 2nd order linear partial differential equation into basic types. The principle of superposition. The wave, diffusion and Poisson's equations. Boundary and initial-value problems. D'Alembert's solution for wave equation. Method of separation of variables. Biharmonic equation.

EIE311 - Electromagnetic Fields and Waves (3 Units)

Review of Vector Algebra & Calculus: Scalar product and vector product, coordinate systems, gradient, curl, divergence operations. Gauss's, Stokes, Hemholtz and Green's integral theorems, integral of scalar and vector fields. Electrostatics: Charge and charge density. Coulomb's Law. Concept of fields. Electric flux density and electric field intensity. Gauss's Theorem and applications. Voltage and electric potential. Conductor, dielectrics. Polarization, susceptibility, permittivity. Electrostatic boundary condition. Capacitance calculation and electric energy. Magnestostatics: Current and current density. Magnetic dipoles and current loops.

Magnetic flux density and magnetic field intensity. Biot-Savart Law and Ampere's Law, Faraday's Law. Magnetostatic boundary condition. Self and mutual induction. Inductance calculation and magnetic energy. Maxwell's Equations: Time Varying fields : Faraday's Law of Induction, the conservation of charge and the incompleteness of Ampere's Law. Maxwell's equations and Lorentz force law. Uniform plane waves and wave equation. Time harmonic fields. Polarization of waves. Poynting's Theorem and the conservation of energy, the field definitions of impedance, admittance. Phase and group velocities. Waves in media: lossy media, dispersive media. Wave Propagation and Transmission Theory: Boundary conditions. Reflection and refraction at plane interface (normal and oblique angles), transmission line analogy. Transmission line theory: differential equations for a general transmission line, low loss and lossless lines, impedance characteristics of lines with various terminations, simple mismatch problems and the use of Smith Chart. Introduction to Waveguides and Cavity Resonators:

EIE312 - Communication Principles (3 Units)

Principles of Communications: An elementary account of the types of transmission. Brief historical development on communications: telegraph, telephony, radio, satellite, data, optical and mobile communications, facsimile. Block diagram of a communication system. The frequency spectrum. Signals and vectors, orthogonal functions, Fourier series, Fourier integral, signal spectrum, convolution, power and energy, correlation. Reasons for modulation. Types of modulation. Amplitude modulation systems: Comparison of AM systems, Methods of generating, and detecting AM, DBS, SSB signals. Vestigial sideband. Frequency mixing and multiplying, frequency division multiplexing, applications of AM systems. Frequency modulation systems: Instantaneous frequency, frequency deviation, modulation index, Bessel coefficients, significant sideband criteria, bandwidth of a sinusoidally modulated FM signal, power of an FM signal, narrowband FM, direct and indirect FM generation, various methods of FM demodulation, discriminator, phase-lock loop; limiter, pre-emphasis and de-emphasis, stereophonic FM broadcasting. Noise waveforms and characteristics. Thermal noise, shot noise, noise figure and noise temperature. Cascade network, experimental determination of noise figure. Effect of noise on AM and FM systems. Block diagram of a superheterodyne AM radio receiver, AM broadcast band and specification, signal sensitivity, aerial circuit, i.f. trap, RF amplifier design, frequency mixer, local oscillator design, inter modulation interference, adjacent channel interference, ganging, tracking error, intermediate frequency, automatic gain control, delay agc, diode detector, volume control. FM broadcast band specification, block diagram of a FM radio receiver, limiter and ratio detector, automatic frequency control, squelch circuit, FM mono and FM stereo receivers. AM broadcast band and specification. FM broadcast band and specification. Image frequency. FM mono and FM stereo receivers. TV broadcast band and specification. Signal format, transmitter and receiver block diagrams of Black and White TV, and Colour TV.

EIE313 – Physical Electronics (2 Units)
Free electron motion in static electric and magnetic fields, electronic structure of matter, conductivity in crystalline solids, theory of energy bands in insulators, semi-ion-conductors and conductors: electrons in metals and electron emissions, carriers and transport phenomena in semi conductors, characteristics of resistors, diodes, transistors, photocells and light emitting diodes. Elementary discrete devices fabrication techniques and IC technology.

EIE314 - Electric Circuit Theory I (3 Units)
Electric fields: Fundamental concepts, energy storage. Magnetic fields: Fundamental laws, field calculations, and energy storage. Magnetic circuits: simple calculation of magnetic circuits, B – H curves and core losses. Inductance: Self and mutual inductance, coupled circuits. Transient and steady state response of circuits: RL, RC, RLC circuits, free and forced oscillation. Network analysis: network theorems; mesh and node analysis. One and two – port network: driving point functions, circuit parameters, interconnection and termination, transformation.

EIE315 - Electrical Machines I (3 Units)

Electromechanical energy conversion: Law of conservation of energy. General energy balance equation. Singly excited system (induced voltage, electrical energy and torque equations). Double excited system (electrical energy, induced voltage and torque equations) DC Machines: principles of operation construction simple armature windings-lap and wave. Emf equations. Commutation. Armature reaction DC Generators: methods of excitation (separate series, shunt and compound) conditions for self excitation of shunt generators. Parallel operation of d.c. generators. Characteristics of d.c. generators. D.C. Motors: methods of excitation (separate series, shunt and compound characteristics of D.C motors. Derive expression for torque developed in D.C motors. D.C motor starters speed control (varying the armature voltage varying the field magnetic flux, ward Leonard method) variable and constant losses in D.C. machines. Determining efficiency of D.C machines by Direct loading method, swinburnes method, Hopkins test. Conditions for maximum efficiency of D.C machines. Transformers: construction of single phase transformers. Principle of operation. Drawing phase diagrams for transformers on no-load and on load., " An Ideal transformer, deriving an expression for the turn ratio of a transformer. Emf equations of transformers, approximate equivalent circuit, efficiency voltage regulation. Three phase transformers: Construction grouping and connection of windings parallel operation. Conditions for parallel operation , testing of transformers, list different types of transformers – power, distribution autotransformers, current and voltage transformers. Methods of cooling tap changing. Tests on transformers.

EIE318 - Laboratory Course I (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from courses taught in this semesters. Report on each experiment is to be submitted immediately after the laboratory period for grading.

Omega Semester

GEC320 - Numerical Methods (2 Units)

Numerical Methods: Finite difference. Interpolation. Numerical differentiation and integration. Numerical solution of ordinary differential equations, Trapezoidal, Simpson, Runge Kutta methods. Newton Raphson method for roots of equations. System of simultaneous linear equations. Linear simultaneous equations, Gaussian elimination, Gauss-Seidel iterative method, Jacobi Method, evaluation of determinant and inverse matrix. Eigensystem analysis: system stability, eigenvalue sensitivity, stability of Gauss-Seidel solution, amplitude and time scaling for model studies. Use of numerical analysis software packages to solve simple engineering problems.

GEC321 – Engineer –in- Society II (1 Unit)

Introduction to engineering economy and law for engineers.

GEC324 - Technical Communications (1 Unit)

Introduction to Communications: Principles of effective communication in interpersonal and mass communication process. Verbal, graphical and numerical communications. Written Communication: Principles of technical writing. Types of technical writing, referencing and citation. Styles of writing. Graphs; diagrams presentation. Statistical information presentation. Macro level, and micro-level. Oral Communication: Public speaking skills, multi-media presentation skills. Facilitator and participant skills in meetings. Negotiating skills. Idea-generating skills. Manuscript speaking and presentation involving media and telecommunications. Reading skills: Effective reading skills: extracting main ideas and speed-reading, chunk/cluster-reading and word-attack techniques of technical reading materials. Equipment Manual Writing and Presentation: Component diagrams, assembling, description, and multi-language presentation. Basic troubleshooting information, and technical support information. Marketing strategy.

EIE321 - Introduction to Power Systems (2 Units)

Overview of power system. Single-phase and three-phase power calculations. Simple models of generators and transformers. Calculation of inductances of single-phase and three-phase lines. GMR and GMD. Bundled conductors. Calculation of capacitance of single-phase and three-phase lines. Current and voltage relations: Short, medium and long lines. Network equations and calculations: Power system components and equipment: Transformers, fuse cut outs, lightning arresters, voltage regulators, capacitors, switches, circuit breakers, reclosers, insulators, etc. Tariff and power factor improvements.

EIE322 - Signals and Systems (3 Units)

Continuous and discrete signals: transformations and inverse transformations, spectral analysis of steps, ramps and impulse, signal description by impulse and step functions. The independent variables: definition of rise time, settling time, overshoot, period magnitude and duration of a signal. Fourier analysis: periodic and non-periodic signals; Perseval theorem. Devices and models: network analysis and circuit with independent and dependent sources. Time invariant and stationary systems.

EIE323 - Analogue Electronics (2 Units)

Review of single stage transistor amplifiers using BJTs and FETs. Equivalent circuit and calculation of current gain, voltage gain, power gain, input and output impedance. Operational Amplifiers: Parameters and applications, Feedback, Broadband and narrow band amplifiers. Power amplifiers, voltage and current stabilizing circuits, voltage amplifiers, multi-0stage amplifiers using BJT and FETs.

EIE324 - Electric Circuit Theory II (3 Units)

Laplace transform methods in circuits analysis, transfer functions, pole – zero analysis, graphical representation. Basic state variable approach. Filter: rectifier filter. LC filters, K - & M – derived filters, frequency response. Network graphs and topology: basic concepts, application to non – planar networks. Waveforms and harmonics: Fourier analysis,

approximate harmonic analysis, circuits with non – sinusoidal excitation. Symmetrical components: Basic concepts and simple application.

EIE325 - Use of Engineering Packages (1 Unit)
Practical hands-on proficiency in the use of engineering packages for analysis, design, and simulation such as MATLAB, PSPICE, etc. It is a computer laboratory course.

EIE326 - Software Development Techniques (2 Units)
Engineering practices for the development of non-trivial software-intensive systems including requirement specification, Software architecture, implementation, verification and maintenance. Iterative development. Recognized standards, guidelines and models. Flowchart ANSI symbols and usage. Extensive examples, and exercises using pseudo-code/flowchart to solve practical problems in engineering. Debugging and documentation techniques. Programming using a structured language such as C: Symbols, keywords, identifiers, data types, operators, various statements, operator precedence, type conversion, conditional and control structures, function, recursive functions. Arrays: 1-D, and multi-dimensional arrays, passing elements or whole array to a function. Simple sorting and searching on arrays, pointers, strings, dynamic memory allocation. Structures and Unions: Structure declaration and definition, accessing structures, array of structures, pointers and structures, union declaration, enumerated variables. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, random access files. Advanced Topics: Command line parameters, pointers to functions, creation of header files, stacks, linked lists ,bitwise manipulation. Software development in C in MS Windows , UNIX/LINUX environments, header file, preprocessor directives, make, Makefile. Static and dynamic linking libraries. Extensive examples, and exercises programming in C to solve practical problems in engineering. Exercises are to be done in the Computer Laboratory.

EIE327 - Digital Electronics (3 Units)

Number Systems and Code. Logic Gates. Simplification of Logic Expressions using Boolean algebra. Simplification of Logic expressions using Karnaugh Maps. Combinational Logic Circuit Design Analysis and Synthesis. Algorithms for deriving minimal SOP forms from K-maps. POS form using K-maps. Algorithms for deriving minimal POS forms from K-maps. Computer-aided minimization of switching functions. Digital vs. analog systems. Mixed signal design, analogue and digital grounding. Digital system design hierarchy. Logic devices : TTL and CMOS families, technology, applications, signal levels, mixing, and interfacing. Interference and noise. Memory devices. Latches, Flip-flops. Sequential Logic Design: Counters, Registers. Timing circuits. Modular Design. Decoders. Decoder Circuit Structures. Implementing Logic Functions Using Decoder. Encoder Circuit Structures. Multiplexers/Data. Selectors. Multiplexer Circuit Structures. Applications of Multiplexers. Demultiplexers/Data Distributors. Arithmetic Circuits: Half Adder/Subtractors Full Adders/Subtractors. Comparators. Arithmetic Overflow Detection. Design Example: A Computer Arithmetic Logic Unit. Computer-aided Design of Modular Systems.

EIE328 - Laboratory Course II (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from courses taught in this semesters. Report on each experiment is to be submitted immediately after the laboratory period for grading.

400 Level

Alpha Semester

GEC410 - Probability and Statistics (2 Units)

Probability and Statistics: Probability space, theorems. Conditional probability and independence. random variables, discrete and continuous distributions, mean and variance. Bernouli, Binomial, Poisson,

hypergeometric, exponential, normal distributions and their characteristics. Examples of experimental measurement and reliability. Elementary sampling theory for normal population. Central limit theorem. Statistical inference (point and interval estimation and hypothesis testing) on means, proportions and variances. Power and operating characteristics of tests. Chi-squares test of goodness of fit. Simple linear regressions.

EIE411 - Computer Organisation and Architecture (3 Units)

Computer Fundamentals: Development history of computer hardware and software. Hardwired vs stored program concept. Von-Neuman architecture. Havard architecture: principle of operation, advantages, disadvantages. Single address machine. Contemporary computers. Computer system: block diagram, functions, examples, dataflow, control line. Computer Arithmetic: integer arithmetic (addition, subtraction, multiplication, division), floating-point representation (IEEE), floating-point arithmetic. arithmetic and logic unit (ALU). Introduction to CISC and RISC architecture: principle of operation, merits, demerits. Storage and Input/Output Systems: Computer function (fetch and execute cycles), interrupts, interconnection structures (Bus structure and bus types), Overview of memory system, memory chip organization and error correction, cache memory, memory storage devices. Overview of I/O, programmed and interrupt-driven I/Os, DMA, I/O channel and I/O processor. Control Unit: Micro-operations, control of the CPU, hardwired implementation, control unit operation, micro-instruction sequencing and execution, micro-programmed control. Use INTEL family, and MOTOROLA family as case study of a CISC computer system. Instruction Set and Register: Machine instruction characteristics, types of operands and operations, instruction functions, addressing modes, instruction formats, register organization, instruction pipelining. High performance computer systems: Techniques to achieve high performance, pipelining, storage hierarchy, units with function dedicated for I/O. RISC, introduction to superscalar processor, parallel processor. Use popular RISC processor (e.g. i960, Motorola PowerPC) as case study.

Operating System:

Overview of operating system, dimension and type of operating system, high level scheduling, short-term scheduling, I/O scheduling, memory management, virtual memory, UNIX/LINUX operating system: architecture, commands, programming; window based operating systems (MS windows, X-window).

EIE412 - Control Systems (3 Units)

Introduction: definition, examples of control systems. Open-loop and closed-loop control systems. Review of Laplace and inverse Laplace transforms. System modelling: Signal flow graph, block diagram. Transfer function. Poles and zeros. Block diagram reduction using signal flow graph and block diagram reduction techniques. Mechanical, electrical and electromechanical systems. First and second order models, higher order models. Definitions of transient response parameters. Analysis of second-order system as prototype. Routh-Hurwitz stability criterion. Classification of systems based on steady-state characteristics, steady-state error coefficient. Definition of Root locus, Properties of root locus, sketching of root locus plots. Effect of open-loop zeros and poles. Root locus design concepts. Frequency response analysis and design: Bode diagram, Polar plot, Nichols plot. Nyquist stability criterion: non-mathematical description of Nyquist criterion, interpretation of stability. Relative stability - Gain and phase margins. Closed-loop frequency response analysis - M and N contours, Nichols chart. Compensation techniques: lag, lead and lag-lead compensation, PD, PI and PID controllers. Cascade compensation based on root-locus method. Introduction to Feedback compensation. Computer-aided design and analysis of control system.

EIE413 - Laboratory Course and Mini Project (1 Unit)

Laboratory investigations and group mini-projects in computer, Electrical & Electronics, and Information & Communication Engineering. The write-up report on the project is to be submitted for grading and defence by each group.

EIE414 - Design and Installation of Electrical and ICT Services (2 Units)

Electrical Installation: Introduction to Health and Safety at Work Act in Nigeria. Electrical safety. First aid. Electricity supply regulations. Lighting and Illumination: Luminous intensity and flux. Maintenance factor. Coefficient of utilization. Types of light sources. Calculation of lighting requirements. Glare. Stroboscopic effect. Installation Materials, cables, junction box, terminations, joints. Conduits and ducting. Truck and truncking. Electrical Installation design in domestic, commercial, and industry. Alarm and emergency systems. Earthing and Protection. Purposes of earthing. Faraday cage. Rod electrodes. Earth electrode resistance. Earthing system. Earth fault loop impedance. ICT services: NCC and FCC codes of practice and standards. Telecommunication design and installation: Satellite, VSAT, etc. Telephone design and installation. Computer networking design and installation. Wireless LAN design and installation. Preparation of Bill of Engineering Measurement Evaluation. Contract bidding. Consultancy.

CEN414 - Object-oriented Design and Programming (3 Units)

Introduction: Comparison of procedure-oriented, event-driven, and object-oriented programming paradigms, Fundamental of object oriented design. Features of object-oriented programming. JAVA Runtime Environment, JVM, compilers, Interpreters, etc. numerical data, variable, constants, and arithmetic expressions. JAVA Basics: Standard input and output statements. Escape sequences, math class. JAVA API, the if statement, Boolean expression and variables, nested if, the switch statement, iteration statement-the while, and for statements. Array and Collection: Creating an array, accessing array elements passing arrays as parameters, two dimensional arrays, list and maps. Object oriented programming: Introduction, Object oriented concepts, attributes and methods, encapsulation, polymorphism, implementation of classes. Event-Drive Programming and Basic GUI objects: Creating a subclass of Jframe, placing Buttons on the Content pane of a frame. Handling button Events, Jlabel, JTextField, and JTextArea Classes, Menu. Graphics, file, and Application Developments, Application developments. File inpute and output: file and JFileChooser Objects, Low-level file 1/O, and Object 1/O. web programming, Java Scripts, Applets.

CEN416 - Assembly Language Programming (2 Units)

Introduction: Language level of abstraction and effect on machine, characteristics of machine code, advantages , justifications of machine code programming, instruction set and dependency on underlying processor. Intel 8086 microprocessor assembly language programming: Programming model as resources available to programmer, addressing modes, instruction format, instruction set- arithmetic, logical, string, branching, program control, machine control, input/output , etc; assembler directives, hand-assembling, additional 80x86/Pentium instructions. Modular programming. Interrupt and service routine. Interfacing of assembly language to C . Intel 80x87 floating point programming. Introduction to MMX and SSE programming. Motorola 680x0 assembly language programming. Extensive practical engineering problems solving in assembly language using MASM for Intel, and cross-assembler for Motorola.

CEN417 - Prototyping Techniques (2 Units)

Introduction: Grounding, ground plane, digital ground, analogue ground, power decoupling, inductance and capacitive effects, feedthrough capacitors. Soldering techniques for pass-through and surface mount components, desoldering. Breadboarding, veroboarding. Wire wrapping techniques. Radio Frequency design and implementation techniques. Printed Circuit Board techniques, and production of PCB. Use of PCB CAD packages. Construction exercises using different prototyping techniques.

EIE418 - Data Communications and Computer Network (3 Units)

Interfacing: Interfaces for simple computer system and terminal to terminal. MODEM, terminal interfaces, CCITT V.24/RS-232, CCITT V.28, V.35, GPIB, EIA, RS-232C standard, speed and distance limitations for V.24, RS-232C, RS-449/422/423 interfaces and standards. Channel Coding and Error Control: Forward Error Control; Error

Detection Methods; Parity Checking; Linear Block Codes, Cyclic Redundancy Checking; Feedback Error Control. Digitalisation: Sampling theorem, Shannon theorem, PCM and Quantisation Error; Multiplexing, FDM, TDM; Higher order multiplexing; Frame formatting, time-slot. Digital Modulation Techniques: Line coding, intersymbol interference, Nyquist wave shaping, eye pattern, adaptive equalization. Transmission over bandpass channel. ASK, FSK, PSK, DPSK, M-ary modulation, continuous phase FSK, MSK, QAM, DSL Schemes. Spread Spectrum Communications: Pseudo noise sequences, direct sequence spread spectrum, frequency hopping spread spectrum, CDMA, application examples. Telephony: The telephone set and subscriber loop interface, basic function of the telephone set, cordless telephone, local loop, line characteristics and conditioning. Public switched telephone network, hybrids, echo suppression. Central office switching system. Digital Switching: Digital Switching Systems, Space Switching, Time Switching Module; Time-Space-Time Switch Structure, Circuit switching networks; Packet switching networks; X.25 packet switched networks. ISDN interfaces and functions: Transmission structure, user-network interface configurations, ISDN protocol architecture, connections, addressing. Physical layer. Data link layer, network layer. Frame Relay: Background. Protocols and service. Frame-mode protocol architecture, frame-mode call control, Frame relay congestion control: Traffic rate management, explicit congestion avoidance and implicit congestion control. ATM: Virtual channels and virtual path. ATM protocols, transmission of ATM cells, ATM adaptation layer. AAL services. Traffic and congestion control. Latency/speed effect, cell delay variation. Network resource management, connection admission control, usage parameter control, priority control. Cellular Mobile Network: 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. Call Processing and Signalling: Roaming and mobility management; Traffic engineering and performance issues, call set up and hand-offs; Capacity planning; Factors affecting economical network designs.

Omega Semester

GEC429 - Students Industrial Work Experience (SIWES) (6 Units)

During the SIWES, each student will undergo a practical on the job training in engineering industry approved for its relevance to the student's major for a minimum of 28 weeks starting immediately after the first semester examinations at 400 level. A programme of training will be drawn by the College and the Industry for each student, and a prescribed log book with daily recording of the student activities is to be kept by each student and appropriately signed. At the end of the programme, a written report is to be submitted to the college and each student to present a seminar on his/her industrial experience. Each student must pass a prescribed certification examination during the industrial training.

500 Level

Alpha Semester

EIE510 - Research Methodology (1 Unit)

Definition of Research, Charateristics of Research, Types of Reseacrh, The Reseacrh Process,Formulating the Reseacrh Problem,Considerations in Selecting a Reseacrh Problem, Reviewing the Literature, Procedure for reviewing the Literature, The Formulation of Objectives, Preparing the Reseacrh Design, Consideration for the Research Design,Guidelines to construct a Research tool,Constructing a Questionnaire, Piloting the Questionnaire,Collecting Data, Ethical Issues concerning reseacrh participants, Ethical Issues relating to the researcher,Processing and Analyzing Data, The Data Processing Operations, Data Analyzing methods,Generalization and interpreation of the Results, Reporting the Findings, Written Research Project Report Format,General Attributes of a Reseacrh Proposal, What distinguishes an Engineering Reseacrh Proposal, Components of a Reseach Proposal,Costing an Engineering Reseacrh Proposal.

EIE511 - Project Management (2 Units)

Management Concepts. Project organization, teams, methods and tools for project management. Organization 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. Quality measurement.

EIE512 - Systems Reliability and Maintainability (2 Units)

Introduction to reliability, maintainability, reliability specification and metrics. Application to computer hardware system, communication equipment, power systems, electronic components. Basic maintenance types, and procedures for computers and digital communication systems. Fault troubleshooting techniques. QoS and time of availability of data communications. Quality control techniques. Design for higher Metrics, fault avoidance, fault tolerance, programming for reliability, software safety and hazard analysis. Comparison of hardware and software reliability. Software Quality and Assurance: definition of software quality, software quality factors, quality control, cost of quality , quality assurance. SQA activities, formal technical reviews, software quality metrics, statistical quality assurance. ISO 9000 Requirements and certification, ISO 9000-3 for software quality process, process documentation, quality audit. Capability Maturity Model: Software Engineering Institute, levels of maturity, key process areas, Comparison between ISO 9000 Standards and CMM. Ensuring Quality and Reliability: verification and validation, measurement tracking and feedback mechanism, total quality management, risk management.

EIE513 - Cyberpreneurship and Cyber Law (2 Units)

Introduction: Definition of creativity, innovation, examples of creativity leading to innovation, commercialization of creative and innovative ideas.

Trends in technology development. Entrepreneurship management and ownership. Characteristics of entrepreneur, starting a new business, business planning, strategic planning and management, site selection and layout. Establishing new venture, risk management. Business Plan Development: definition, need, preparation of business plan. Forecasting developments and charting an action plan. Identifying the product/service, market research and feasibility study. Financing business. Sources of debt financing. Creating the marketing plan, pricing, creative advertising and promotion. Entrepreneurship case studies: Overview and analysis of successful entrepreneurs such as Bill Gates, Michael Dell, David Filo and Jerry Yang of Yahoo, etc. Nigerian entrepreneurship. Discussion of Nigerian business environment, and illustrated with successful Nigerian entrepreneurs. Overview of the Nigerian Legal System: Civil and criminal. Basic concepts of law. Contract Law. Current issues: digital signatures, intellectual property and copyright. Speech Law: Defamation, Sedition, Printing Press Act. Speech on the Internet. Advertising Code: Made in Nigeria rules and guidelines, Advertising standards. Media and Licensing law in Nigerian: Developing an in-depth understanding of the nature and function of Nigerian cyber law. Public and private licensing. Intellectual and moral rights. Music royalties, synchronization rights, performance rights. Role of music publishers. Broadcast rights, merchandising. Detailed analysis of Communications and Multimedia Act. Ethic and Etiquette: New codes of social behaviour: the right to privacy.

CEN510 - Digital System Design with VDHL (3 Units)

Finite State Machine: definition, Mealy and Moore models, state diagram, state table, transition table. Sequential circuits design using flip-flops, asynchronous, and synchronous circuit design. Algorithm State Machine. Design examples and exercises. Structured Design: Design constructs, Design Levels, Geometry-based interchange formats, Computer aided electronic system design tools, Schematic circuit capture, Hardware description languages, Design process (simulation, synthesis), Structural design decomposition. Introduction to VHDL: VHDL language abstractions, Design hierarchies, VHDL component, Lexical description, VHDL source file, Data types, Data objects, Language statements, Concurrent VHDL, Sequential VHDL, Advanced features of VHDL (library, package and subprograms). Structural level modeling, Register-Transfer level modeling, FSM with datapath level modeling, Algorithmic level modeling. Introduction of ASIC, Types of ASIC, ASIC design process, Standard cell ASIC synthesis, FPGA Design Paradigm, FPGA synthesis, FPGA/CPLD Architectures. VHDL Design: Top-down design flow, Verification, simulation alternatives, simulation speed, Formal verification, Recommendations for verification, Writing RTL VHDL code for synthesis, top-down design with FPGA. VHDL synthesis, optimization and mapping, constraints, technology library, delay calculation, synthesis tool, synthesis directives. Computer-aided design of logic circuits.

CEN511 - Embedded System Design and Programming (3 Units)

Introduction to embedded system, components, characteristics, applications. Intel 8051/8031 Micro-controller: Features of the 8051/8031 family, block diagram and definitions of the pin of the 8051, I/O port structure, memory organisation: general purpose RAM, bit addressable RAM, register bank, special function registers, external memory, memory space mapping and decoding, bus control signals timing, a typical 8051 micro-controller based system. Instruction Set and Assembly Language Programming: Addressing modes, the 8051 instruction set and typical examples, assembler operation, assembly language format, assembler directives, operation of assemblers and linkers, programming examples. On-chip Peripheral Devices:I/O ports, operations and uses of port 0, port 1, port 2, port 3, timers: their operations, programming, and applications, serial port: operations and programming, typical applications, serial port interrupt. Interfacing to external memory, keypad, seven-segment LED display, ADC and DAC chips, and input / output port expansion, description and uses of hardware development tools. MOTOROLA M6811 Micro-controller: Features of the M6811 family, block diagram and definitions of the pin of the M6811, I/O port structure, memory organisation: general purpose RAM, bit addressable RAM, register bank, special function registers, external memory, memory space mapping and decoding, bus control signals timing. Instruction Set and Assembly Language Programming. On-chip peripheral devices and I/O interfacing. Introduction to PIC microcontroller: general architecture, applications and selection of microcontroller, advantages, low-end, and high performance PIC. Specific PIC microcontrollers: Features, architecture, block diagram, pin configuration, on-chip memory, and peripheral. Instruction set and Assembly language programming. Serial I/O interfacing: I2C, and SPI interfacing and programming. Memory interfacing: external memory interfacing, EEPROM and Flash memory interfacing. Design exercises using development system.

EIE515 - Digital Signal Processing (3 Units)

Introduction: Advantages of digital over analogue signal processing, problems of digitization, overview of application of DSP, basic elements of DSP system. Digital Processing of analogue signals: Sampling of analogue signals, sampling theorem, aliasing, quantization, noise, and coding, types and selection of ADC/DAC, Sigma-delta ADC. Analytical tools: z-transform, properties, transfer function, inverse z-transform, z-plane poles and zeros, analysis of linear time-invariant in z-domain, system stability. Discrete Fourier Analysis: Discrete Fourier Transform and properties, inverse DFT, truncated Fourier transform, windowing, FFT algorithms. Discrete Time Signals & systems: Discrete time sequences (signals), classification and determination of discrete time system, discrete time i/o description (difference equation), solution of difference equations, convolution, correlation, impulse response. Digital Filters: Definition and types. FIR filters: Transfer function, characteristics, applications, design methods, Gibb's effect and elimination, fir filter realisation. IIR filter: Transfer function, characteristics, applications, overview of analogue filter design techniques, design methods-conversion from analogue to digital filter design techniques, IIR filter realization. Structure of Discrete Time System: Block diagram representation of constant coefficient difference equations, IIR and FIR systems and their basic structures, stability of discrete time systems. Software implementation of dsp algorithms. DSP Microprocessors: Architecture, fixed point vs floating point DSP, Finite word length effects. DSP chips: interfacing and programming. Practical application of DSP in audio, and video.

EIE517 - Applied Electronics (2 Units)

Radio Frequency Amplifiers: Resonance, Circuit Q and Bandwidth, Small-Signal RF Amplifier Design, Coupling Tuned Circuits, Transformer Coupling, Double-Tuned Circuits, IF Amplifiers, Ceramic Filters, RF Power Amplifiers, Neutralization, Impedance Matching Networks. S-Parameter Theory and Applications: Properties of S Parameters, Power-Gain Equations, Amplifier Stability, Constant-Gain Circles, Constant Operating Power-Gain Circles, Constant-Noise-Figure Circles. Small-Signal and Narrowband Amplifiers: DC Biasing Circuits, High-Gain Amplifier, Low-Noise Amplifier. Balanced Amplifiers: Lange Couplers, Balanced Amplifier Design, Power-combining techniques. Large-Signal and Broadband Amplifiers: Large-Signal Amplifier, High-Power Amplifier, Low-Noise Amplifier, Broadband Amplifier, Feedback Techniques, Distributed Amplifier. Microwave Oscillators: Oscillation Conditions, Oscillator Circuit Configurations, Tuning Circuits, One-Port Oscillator, Two-Port Oscillator, High-Power Oscillator, Broadband Oscillator. Phase-Locked Loop: Principle of operation, phase detector, voltage controlled oscillator, capture and locked range, Loop Frequency Response, Transient response, applications of PLL: frequency synthesis, pulse transmission synchronization. Video Bandwidth and Resolution, Transmitted Video and Audio Signals.

EIE519 - Project I (2 Units)

Each student is required to undertake a project that gives productivity value to the academic knowledge gained in his\her field of study. The project shall involve problem solving using engineering theories and techniques, and the implementation of the project design. The student is expected to design a possible solution to the problem, taking into account various aspects such as professionalism, economy, costing, and engineering viability. At the end of the first semester, each student shall present a seminar on his/her project.

Omega Semester

CEN520 - Robotics and Automation (2 Units)

Robot classification and manipulation. Technology and history of development of robots. Applications. Direct and inverse kinematics: arm equation. Workspace analysis and trajectory planning. Differential motion and static. Manipulator dynamics. End-of arm tooling. Automation sensors. Robot vision. Work-cell support systems. Robot and system integration. Safety. Human interface. Robot control system. Circuit and system configuration. Task oriented control. Robot control programming. Fuzzy logic and AI based robot control. Fundamentals of automation. Strategies and economic consideration. Integration of systems. Impact to the production factory. Evaluation of conventional processes. Analysis of automated flow lines. Assembly systems and line balancing. Automated assembly systems. Numerical control and adaptive control. Robot applications. Automated materials handling and storage systems. Automation in inspection and testing. Linear feedback control system. Optimal control. Computer process control. Computer integrated manufacturing systems. Future automated factory.

CEN521 - Software Engineering (2 Units)

Introduction: Principles of software engineering. Software life cycle. Project management. Computer based system engineering. Requirements and Specification: Analysis, definition, specification, software prototyping, formal specification, algebraic specification and model-based specification. Software Design: Architectural design. Object-oriented design. Function-oriented design. Real-time system design. User interface design. Dependable Systems. Reliability and reusability. Safety-critical consideration. Good programming practice. Computer-aided Software Engineering (CASE). Verification and Validation: Validation and testing. Problems of assessing and quantifying the system reliability. Test case and test data design. Management: People and organization issues. Cost estimation. Quality management. Process improvement. Maintenance, configuration and re-engineering of software.

CEN522 - Microprocessor Systems and Interfacing (3 Units)

A basic microprocessor system: the CPU, memory, I/O, and buses subsystems, basic operation of a microprocessor system: fetch and execute cycle, the architecture of some typical 8-bit, 16-bit microprocessors (INTEL, MOTOROLA) and their features. Programming model in real mode: registers, memory, addressing modes. Organisation of the interrupt system, interrupt vectors, and external interrupts, implementation of single and multiple interrupts in real mode. Programming model in protected mode: registers, memory management and address translation, descriptor and page tables, system control instructions, multitasking and memory protection, addressing modes, and interrupt system.

Memory interfacing and address decoding. I/O interfacing: memory mapped i/o, isolated i/o, bus timing, i/o instructions. Peripheral devices interfacing: 8255 PPI/6821 PIA, 8251 USART/6821 UART, DMA, Timer/Counter chips, etc. Instruction set. Assembly language Programming of INTEL and MOTOROLA microprocessors. Discussion of a typical system e.g. IBM PC, Apple Macintosh.

EIE526 - Digital Image Processing (2 Units)

Introduction: definition, problems, and applications of digital image processing. Digital image acquisition devices. Digital image formats. Edge detection techniques, segmentation methods. Image Morphology. Image enhancement. Image restoration techniques. Morphology. Fourier transform and Wavelet transform in image processing. Image registration techniques. Shape analysis. Image understanding. Artificial neural network and image understanding. Colour representation standards, equations, processing, quantization, and dithering. Case study: practical application of image processing to face recognition, fingerprint, iris, etc. Introduction to image compression techniques.

CEN523 - Computer Networking and Security (3 Units)

Advanced treatment of fundamental problems in computer networking and packet switching. Internet routing and gateway protocols, traffic engineering and multi – protocol label switching techniques, quality of service mechanisms, network and applications level signaling, real – time multimedia communications. Safety problems in computer security, information flow and access control models, security in distributed systems, design of secure systems.

EEE529 - Introduction to Mechatronics (2 Units)
Definition and application of the synergy. Mechanical gear system, rack and pinion, worm and screw, and simple calculations. Electrical transformer as equivalent of mechanical gear. Analogue sensors: pressure, temperature, linear displacement, angular displacement, rate gyro, acceleration, light sensors, ir sensors, hall effect sensors. Motion detection. Digital sensors: heading sensor, gps, gsm, compass, digital infrared sensor, shaft encoder, and their interfacing. Actuators: DC motors, servo, stepper motor, ac motor, linear actuator, relays. Signal conditioning, introduction to adc and dac.

EIE529 - Project II (6 Units)
The project work is to be completed in this second phase. Each student is to submit a proper written report (binded 3 hardcopies, and a CD-ROM of electronic copy). The project is presented and defended at a seminar.

EIE520 - Artificial Neural Networks (2 Units)
Neural Network: Definition of artificial neural network. Similarities of neural network with 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 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. Engineering applications. ANN programming.

EIE521 - Electromagnetic Interferences (2 Units)
Concern for electromagnetic compatibility. Circuit theory approach and field theory approach. Comparative analysis. Coupling and Shielding:

Capacitive (electric) coupling. Inductive (magnetic) coupling. Shielding of cables. Effects of shield resistance, cause and effects of leakage flux, stray current return paths, methods of adding common-mode impedance. Balanced circuits. Grounding: Grounding of multiple-chassis systems. Signal ground connections. Safety ground connections. Layout and grounding of printed circuit board: layout consideration, current return path, power distribution within a PCB. Radiation: Radiation coupling between distant devices. Superposition of multiple electric and magnetic sources. Cabinet shielding. Absorption losses and reflection losses for nonmagnetic shields. Effects of shield apertures: current flow in shields, slot antenna theory, waveguide theory. Shield penetration by wires and cables. Interconnecting leads as antennas, treatment of power, low frequency and high frequency leads. EMC Regulations and Measurements: Civilian regulations. Measurement of radiated emissions. Anechoic Chamber. Test site calibration. Measurement of conducted emissions.

EIE524 - Cryptography Principles and Applications (2 Units)

History of cryptographic System, Public Key Systems, Digital Signatures. Information Theory: Entropy, Perfect Secrecy, Unicity Distance, Complexity Theory, NP Completeness, Number Theory. Data Encryption Methods : Transposition Ciphers, Substitution Ciphers, Product Ciphers, Exponentiation Ciphers, Knapsack Ciphers, Breakable NP-Complete Knapsack, Encryption Standards DES, RSA, 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, Ethical Issue in Computer Security.

EIE525 - Fuzzy Logic and Programming (2 Units)

Introduction: fuzzy set theory, knowledge base problem, objective and subjective knowledge, crisp sets, fuzzy sets, linguistic variables, membership functions. Set theoretic operations, comparison between crisp sets and fuzzy sets. Law of Contradiction and Law of Excluded Middle, fuzzy intersection, union and complement, and other fuzzy operators. Fuzzy relations and compositions on the same and different product spaces. Max-Min composition, Max-Product composition, fuzzy relational matrix, sup-star composition. Hedges or modifiers of linguistic variables, fuzzy logic vs. probability. Fuzzy reasoning and implication, the fuzzy truth tables, traditional propositional logic and the rule of inference, the Modus Ponens and Modus Tollens, fuzzy modeling with causal IF-THEN statements. Fuzzy Models, fuzzy logic systems, combination of fuzzy basis functions, universal approximator, fuzzy neural network, fuzzy associate memory matrix, self-learning fuzzy systems. Fuzzy logic system applications. Fuzzy programming.

EIE526 - Digital Image Processing (2 Units)

Introduction: definition, problems, and applications of digital image processing. Digital image acquisition devices. Digital image formats. Edge detection techniques, segmentation methods. Image Morphology. Image enhancement. Image restoration techniques. Morphology. Fourier transform and Wavelet transform in image processing. Image registration techniques. Shape analysis. Image understanding. Artificial neural network and image understanding. Colour representation standards, equations, processing, quantization, and dithering. Case study: practical application of image processing to face recognition, fingerprint, iris, etc. Introduction to image compression techniques.

EIE528 - Digital Control Systems (2 Units)

Introduction: Advantages, and configuration. Concept of sampling: Nyquist sampling theorem, aliasing, multiple channel sampling, choice of ADC and DAC. Difference equation and solution. The z-transform: direct, transfer function, inverse transform methods, response of linear discrete system. Z-transform applications. Z-transform of sampling instants, zero-order-hold, Z and S plane relationship. Closed loop sampled data system, stability analysis. Finite word length effect. Digital PID algorithm and compensator design. Root locus of digital control system. Sequential control system design. State variable of dynamic system, solution of state equations, transition matrix, eigenvalues, eigenvector. SCADA system. CAD digital control system.

5.2.2 ELECTRICAL AND ELECTRONICS ENGINEERING PROGRAMME

PROGRAMME: Electrical and Electronics Engineering

DEGREE AWARDED: B.Eng (Honours) Electrical and Electronics Engineering

DURATION: Five (5) Years (10 Semesters)

ADMISSION REQUIREMENTS

The minimum entry requirement for admission into the Department of Electrical & Information Engineering Undergraduate Programmes is O'Level SSCE/GCE/ NECO Credit level passes in five (5) subjects, including English and Mathematics, Physics, Chemistry, and either credit pass in Further Mathematics, Biology, or Technical Drawing. Candidates are also expected to sit for the Unified Tertiary Matriculation Examination (UTME) and attain the prescribed cut-off marks, in addition to passing the Covenant University Scholastic Aptitude Screening (CUSAS).

GRADUATION REQUIREMENTS

To graduate from the 5-year Bachelor of Engineering (B. Eng) Degree Programme in Electrical and Electronics Engineering, students must have successfully completed a minimum of 215 Credit Units as shown below:

Graduation Required Units for B. Eng Electrical and Electronics Engineering Programme

Level	Core/ Compulsory	Electives	SWEP	Industrial Training (SIWES)	College courses	University Courses	NUC Courses	Total
100	31					4	10	45
200	38		0			4	6	48
300	43					4	2	49
400	21			6		2		29
500	36	4				4		44
Total	169	4	0	6	0	18	18	215

COURSE STRUCTURE

100 Level Electrical and Electronics Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC117	Technical Drawing	C	2		α
	MAT111	Mathematics I: Algebra	C	3		α
	MAT112	Mathematics II: Trigonometry and Geometry	C	2		α
	PHY111	Mechanics and Properties of Matter	C	2		α
	PHY112	Heat, Sound and Optics	C	2		α
	PHY119	Physics Practicals IA	C	1		α
	CHM111	General Physical Chemistry	C	3		α
	CHM119	General Chemistry Practical I	C	1		α
	MAT121	Mathematics V: Calculus	C	3		Ω
	MAT122	Mathematics VI: Vector Algebra	C	2		Ω
	PHY121	Electricity and Magnetism I	C	2		Ω
	PHY122	Atomic and Nuclear Physics	C	2		Ω
	PHY129	Physics Practicals IB	C	1		Ω
	CHM121	General Organic Chemistry	C	2		Ω
	CHM122	General Inorganic Chemistry	C	2		Ω
	CHM129	General Chemistry Practical II	C	1		Ω
University Courses	EDS111	Entrepreneurial Development Studies I	V	1		α
	TMC111	Total Man Concept I	V	1		α
	TMC112	Total Man Concept - Sports	V	0		α
	EDS121	Entrepreneurial Development Studies II	V	1		Ω
	TMC121	Total Man Concept II	V	1		Ω
	TMC122	Total Man Concept – Sports	V	0		Ω
NUC General Courses	CST111	Use of Library, Study Skills and Information Communication Technology I	U	2		α
	CST121	Use of Library, Study Skills and Information Communication Technology II	U	2		Ω
	GST111	Communication in English	U	2		α
	GST121	Use of Library Study Skills and Information Communication Technology II	U	2		Ω
	GST 122	Communication In French	U	2		Ω
			α =22 Ω = 23 Total = 45 Units			

200 Level Electrical and Electronics Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	GEC210	Engineering Mathematics I	C	2	MAT122, 123	α
	GEC211	Introduction to Electrical Engineering I	C	2		α
	GEC212	Engineering Graphics	C	2		α
	GEC213	Material Science and Raw Material Studies	C	2		α
	GEC214	Applied Mechanics	C	3		α
	GEC215	Applied Computer Programming I	C	2	CST121	α
	GEC216	General Engineering Laboratory I	C	3		α
	GEC217	Engineer-in-Society I	C	1		α
	GEC218	Workshop Technology	C	2		α
	GEC220	Engineering Mathematics II	C	2		Ω
	GEC221	Thermodynamics	C	2		Ω
	GEC222	Computer Aided Design and Manufacture	C	2		Ω
	GEC223	Fluid Mechanics	C	2		Ω
	GEC224	Strength of Materials	C	2		Ω
	GEC225	Applied Computer Programming II	C	2		Ω
	GEC226	General Engineering Laboratory II	C	3		Ω
	GEC227	Electrical Measurements and Instrumentations	C	2		Ω
	GEC228	Introduction to Electrical Engineering II	C	2		Ω
SWEP	GEC229*	Student Workshop Experience Programme (SWEP)	S	0		Ω
University Courses	EDS211	Entrepreneurial Development Studies III	V	1		α
	TMC211	Total Man Concept III	V	1		α
	TMC212	Total Man Concept – Sports	V	0		α
	EDS221	Entrepreneurial Development Studies IV	V	1		Ω
	TMC221	Total Man Concept IV	V	1		Ω
	TMC222	Total Man Concept – Sports	V	0		Ω
NUC General Courses	GST211	Logic, Philosophy and Human Existence	U	2		α
	GST221	Nigerian People and Culture	U	2		Ω
	GST222	Peace Studies and Conflict Resolution	U	2		Ω
			α =23 Ω = 25 Total = 48 Units			

**__NOTE__: GEC229 (SWEP) is done during long vacation*

300 Level Electrical and Electronics Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
	GEC310	Engineering Mathematics III	C	3	GEC220	α
	EIE311	Electromagnetic Fields and Waves	C	3		α
	EIE312	Communication Principles	C	3		α
	EIE313	Physical Electronics	C	2	GEC228	α
	EIE314	Electric Circuit Theory I	C	3	GEC228	α
	EIE315	Electrical Machines I	C	3	GEC228	α
	EIE318	Laboratory Course I	C	3		α
	GEC320	Numerical Methods	C	2	GEC310	Ω
	EIE322	Signal and Systems	C	2		Ω
	GEC324	Technical Communications	C	1		Ω
	EIE321	Introduction to Power Systems	C	2	EIE315	Ω
	EIE323	Analogue Electronics	C	3	EIE313	Ω
	EIE324	Electric Circuit Theory II	C	3	EIE314	Ω
	EIE325	Use of Engineering Packages	C	1		Ω
	EIE326	Software Development Techniques	C	2	GEC225	Ω
	EIE327	Digital Electronics	C	3		Ω
	EIE328	Laboratory Course II	C	3		Ω
	GEC321	Engineer-in-Society II	C	1		Ω
University Courses	EDS311	Entrepreneurial Development Studies V	V	1		α
	TMC311	Total Man Concept V	V	1		α
	TMC312	Total Man Concept – Sports	V	0		α
	EDS321	Entrepreneurial Development Studies VI	V	1		Ω
	TMC321	Total Man Concept VI	V	1		Ω
	TMC322	Total Man Concept – Sports	V	0		Ω
NUC General Course	GST311	History and Philosophy of Science	U	2		α
			α =24 Ω = 25 Total = 49 Units			

400 Level Electrical and Electronics Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	GEC410	Probability and Statistics	C	2		α
	EIE411	Computer Organization and Architecture	C	3	EIE326	α
	EIE412	Control Systems	C	3		α
	EIE413	Laboratory Course and Mini Project	C	1		α
	EIE414	Design and Installation of Electrical and ICT Services	C	2		α
	EEE414	Electrical Power Generation and Utilization	C	2	EIE321	α
	EEE415	Electrical Machines II	C	2	EEE315	α
	EEE416	Renewable Energy	C	1	EIE321	α
	EEE417	Power Electronics	C	2	EIE313	α
	EIE418	Data Communications and Computer Networks	C	3	EIE312	α
SIWES [Industrial Training]	GEC429	Student Industrial Work Experience Scheme (SIWES) [Industrial Training]	S	6		Ω
University Courses	EDS411	Entrepreneurial Development Studies VII	V	1		α
	TMC411	Total Man Concept VII	V	1		α
	TMC412	Total Man Concept – Sports	V	0		α
			α =23 Ω = 6 Total = 29 Units			

500 Level Electrical and Electronics Engineering

Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	EIE510	Research Methodology	C	1		α
	EIE511	Project Management	C	2		α
	EIE512	Systems Reliability and Maintainability	C	2		α
	EIE513	Cyberpreneurship and Cyber Law	C	2		α
	EIE515	Digital Signal Processing	C	3		α
	EEE510	Control Engineering	C	3		α
	EEE511	Electrical Power Systems	C	3		α
	EIE517	Applied Electronics	C	2		α
	EIE519	Project I	C	0		α
	EEE520	Advanced Instrumentations	C	2	GEC227	Ω
	EEE521	High Voltage Engineering	C	2	EEE511	Ω
	EEE522	Electric Drives	C	2	EEE415	Ω
	EEE523	Industrial Electronics	C	2	EEE417	Ω
	EEE524	Computer and Communication in Power Systems	C	2	EIE312	Ω
	EIE528	Digital Control Systems	C	2		Ω
	*EIE529	Project II	C	6	EIE519	Ω
Electives	***Note:*** *Select* ***at least 4 Credits Units*** *from the following Electives*					
	EIE520	Artificial Neural Network	E	2	CEN512	Ω
	EIE525	Fuzzy Logic and Programming	E	2		Ω
	EIE526	Digital Image Processing	E	2		Ω
	EIE527	Non-Linear Control Systems	E	2	EEE510	Ω
	EEE525	Physics and Technology of Semiconductor Devices	E	2	EIE313	Ω
	EEE526	Electrical Power Systems Planning and Design	E	2	EIE416, EEE511	Ω
	EEE527	Electrical Machines Design	E	2	EIE315, EEE415	Ω
	EEE528	Power System Operations and Controls	E	2	EEE511	Ω
	EEE529	Introduction to Mechatronics	E	2	EEE417	Ω
University Courses	EDS511	Entrepreneurial Development Studies IX	V	1		α
	TMC511	Total Man Concept IX	V	1		α
	TMC512	Total Man Concept – Sports	V	0		α
	EDS521	Entrepreneurial Development Studies X	V	1		Ω
	TMC521	Total Man Concept X	V	1		Ω
	TMC522	Total Man Concept – Sports	V	0		Ω
			α =20 Ω = 24 Total = 44 Units			

**EIE529 is a continuation of EIE519*

COURSE DESCRIPTION

100 Level

Alpha Semester

GEC117 - Technical Drawing (2 Units)

Drawing Tools: Description, Uses and Maintenance, Line Work: Definition of points, lines and planes, Types of lines (Description, Uses), Dimensioning: Examples like arrow heads, solid dots and crosses; of straight lines, of circles, inadequate space dimensioning, Common Errors in line drawings, Lettering, Drawing Sheets Format, Border Lines and Title Block. Plane Geometry: Angles (Types and their construction), Triangles (Types and their construction), Quadrilaterals (Types and their construction), Polygons (Types and their construction), Circle and It's Parts, Inscribing and Circumscribing Circles, Tangents (Internal and External), Ellipse (Different Methods of construction), Plane and Diagonal Scales. Orthographic Projection: Basic Introduction: Description, Plan, Elevations, 1st Angle Projection, 3rd Angle Projection, Sectioning, Exercises.

MAT111 - Mathematics 1: Algebra (3 Units)

Algebra of Sets; special sets (NCZCRCC); theory of indices, law of logarithms, indical equations, surdic equations. Polynomials, the remainder and factor theorems; polynomial equations and inequalities-especially linear, quadratic and `cubic. Solving quadratic equation and cubic equations with an integral root. Domain and zeroes of rational functions. Partial fractions. Permutations and combinations. The binomial theorem for any index and applications. Sequences and series of real numbers (including AP and GP). Algebra of complex numbers. Introduction to m x n matrices; elementary operations on matrices and applications to solution of linear equations. Elementary properties of determinants of at most 3 x 3 matrices; The Rule of Sarrus.

MAT112 - Mathematics II: Trigonometry and Analytical Geometry (2 Units)

Trigonometric functions; exponential and logarithmic functions. Circular measure; hyperbolic functions. Equations of lines and planes; conic sections (circle, parabola, hyperbola, ellipse).

PHY111 - Mechanics and Properties of Matter (2 Units)

Units and dimensions, scalars and vectors, particle kinematics, Newton's laws, friction, work, energy, centre of mass, simple harmonic motion, rigid body dynamics, kepler's laws, pressure in fluids, intermolecular forces, Hooke's law, Young's modulus, fluid flow streamline turbulence, stroke's law, surface tension.

PHY112 - Heat, Sound and Optics (2 Units)

Temperature, thermometers, heat transfer, PVT –surfaces, Kinetic theory, first and second laws of thermodynamic, transverse and longitudinal waves, standing waves, intensity, beats. Doppler Effect, Electromagnetic spectrum. Huygen's principle, images formed by a single surface thin lenses, aberrations, the eye, optical instruments, interface, single slit, diffraction grating, polarization, elementary examples.

PHY119 - Physics Practical IA (1 Unit)

Simple experiments illustrating the topics covered in PHY111 and PHY112.

A selection from the following experiments use of measuring instruments, viscosity, surface tension oscillations about an equilibrium position, Hooke's law, moment of inertia, focal lengths of lenses, refractive index, optical instruments, the sonometer heat capacity, volume expansion and latent heat.

CHM111 - General Physical Chemistry (3 Units)

Historical development of the atom: atoms, Dalton's atomic theory, atomic masses. Fundamental particles of the atom atomic structure. Modern electronic theory of atoms. Periodicity of the elements. Stoichiometry mole concept, chemical formulas, equations and calculations. State of mater; gas, liquid and solid. Chemical energetics and thermo chemistry. Chemical kinetics, equilibria and electrochemistry.

CHM119 - General Chemistry Practical 1 (1 Unit)

Practice in weighing and measurement of volume, preparations of standard solutions. Titrimetry: acid-base, oxidation-reduction, precipitation and complex metric titrations; gravimetric analysis.

Omega Semester

PHY121 - Electricity and Magnetism I (2 Units)

Coulomb's law, ohm's law, Gauss' Law, capacitors, Ohm's law, Kirchoff's laws, Electrical energy, DC bridges, potentiometer, magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometers, multi-meters, DC and AC motors and generators, power in AC circuits, semiconductors, conductivity and mobility, rectification.

PHY122 - Atomic and Nuclear Physics (2 Units)

Theory of atomic structure., Thompson, Rutherford and Bohr's theories, the hydrogen atom, properties of the electron, e/m, CRO, Millikan's experiment, properties of the nucleus, natural radioactivity, wave particle duality of light, x-rays, photo electricity, thermionic emission, diode valve.

PHY129 - Physics Practical IB (1 Unit)

A selection from the following experiments, potential difference and internal resistance of cells, uses of potentiometer circuit, the meter bridge, simple direct current measuring instruments, Planck's constant, radioactivity.

MAT121 - Mathematics V: Calculus (3 Units)

Functions of Real Variables: Graph, Limits and Concepts of Continuity. Techniques of Differentiation of Algebraic and Trigonometric Functions, Higher Order Derivates, Maxima and Minimal, Leibnitz Rule, Application of Differentiation. Integration as Inverse of Differentiation, Methods of Integration, Definite Integra. Application to Areas, Volumes,

Moment of Inertial. Approximate Integration: Trapezoidal and Simpson's Rule. Taylor's and Mclaurin's Theorems, partial Differentiation and Implicit Differentiation.

MAT122 - Mathematics VI: Vector Algebra (2 Units)

3-Dimensional Cartesian Coordinate Systems. Definition and Representation of Vectors, Algebra of Vectors, Multiplication of a Vector by a Scalar, Addition of Vectors, Scalar Products of two Vectors, Direction Cosines, Calculus of Vector Functions, Differentiation of Vector Function, Integration of Vector Function. Conic: Circles, Parabola, Ellipse and Hyperbola.

CHM121 - General Organic Chemistry (2 Units)

Introduction to and importance of organic chemistry. Qualitative analysis of organic compounds. Isolation and purification of organic compounds. Quantitative analysis of organic compounds. Determination of structure of organic compounds; empirical, molecular and structural formulas. Hybridization; of sp^3, sp^2, sp orbital in carbon. Homologous series and functional groups. Isomerism-structural and stereoisomerism. Aliphatic hydrocarbon chemistry: alkenes, alkynes-nomenclature (IUPAC), physical properties, preparation and chemical reactions with simple mechanism where applicable.

CHM122 - General Inorganic Chemistry (2 Units)

Chemical bonding and structure: ionic, covalent, coordinate covalent (dative), metallic, hydrogen bonding. General properties of compounds formed by the different types of bonding. Influence of bonding on size, shape and structure. Main Group Chemistry (Groups IA – VIIIA): trends in the properties of elements (structure, ionization energies, physical and chemical properties). Properties of selected types of compounds.

CHM129 - General Chemistry Practical II (1 Unit)

Qualitative analysis for common captions and anions. Identification of organic functional groups: hydroxyl, carbonyl, carboxylic, amino groups, sugar, carbohydrate, protein, etc.

200 Level

Alpha Semester

GEC210 - Engineering Mathematics I (2 Units)

Functions, inverse trigonometric functions and principal values, hyperbolic and its inverse, graphs. Concepts of continuity and differentiability. Mean-value theorem. Taylor's series expansion. Integration by parts. Sequences: real numbers, monotone, convergence, limits. Infinite series: convergence tests, addition, multiplication. Power series, radius of convergence, integration, differentiation. Real and imaginary parts, the complex plane, terminology and notation. Complex algebra, DeMoivre's theorem, powers and roots of complex numbers. Euler formula. Elementary functions of a complex variable, polynomials, rational, exponential, trigonometric, hyperbolic, logarithmic, inverse trigonometric and inverse hyperbolic functions. Vectors in R^n space, addition and scalar multiplication, linear combination of vectors, idea of linear dependence and independence. Dot and cross products, triple products, lines and planes.

GEC211 – Introduction to Electrical Engineering 1 (2 Units)

Overview of electrical engineering: meaning and description; devices and systems. Brief introduction to electric power system components: generation, transmission, distribution and loading. Basic electric circuit analysis: circuit quantities (voltage, charge and current, power and energy); circuit elements(resistors, capacitors, inductors); basic laws and theorems (ohm's law, voltage divider and current divider rules, star-delta transformations, Kirchoff's laws); AC circuits (sinusoids, phasors and phasor diagrams for circuit elements and their combinations, impedance and admittance, frequency response of RLC circuits, and resonance); power analysis (instantaneous and average power, power triangle, and power factor). Introduction to electrical transformers and machines: fundamentals of magnetic circuits; transformers (principle of operation, ideal and real properties, types and applications); DC and AC machines (constructional features and principles of operation of dc and ac

generators and motors, and applications). Introduction to OP Amps: ideal OP Amp, inverting and non-inverting amplifiers, summing amplifiers, difference amplifiers, cascaded op amp circuits and applications. Introduction to computer and digital systems: digital building blocks (logic circuits, combinatorial and sequential circuits); fundamentals of computer systems and networks. Introductory communications and control systems: communication systems (description, components, types and examples);control systems (description, components, types, and examples).

GEC212 - Engineering Graphics (2 Units)

Lettering, linework, dimensioning, orthographic projection, sectioning, isometric and oblique pictorial views. Graphical calculus, Architectural Drawing, electrical and communication, and IT symbols and drawing.

GEC213 - Materials Science and Raw Materials Studies (2 Units)

Raw material deposit survey in Nigeria: quantity, location. Processing techniques, and existing processed products. Material characteristics, and composition. Material re-cycling. Physics of materials. Chemistry of materials.

GEC214 - Applied Mechanics (3 Units)

Forces, moments, couples. Equilibrium of simple structures. First and second moments of area; centroids. Kinematics of rigid bodies in plane motion. Applications of Newton's laws of motion. Kinetic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature. The stress circle, deflection, deflection of beams. Shear forces and bending moments, analytical and graphical methods for structures. Design and analysis of communication towers, standards, and regulations.

GEC215 - Applied Computer Programming I (2 Units)

Software development life cycle (SDLC). Definitions, SDLC models: Waterfall model, V – shaped model, Incremental model, Spiral model. Program design: Algorithms: Key features of algorithms and different ways of presenting algorithms. Flow charting of algorithm. Pseudocode:

Pseudocode statements for input, output, iteration, decision, and processing, Arithmetic, relational and logical operations on Pseudocode, use of sub – process in Pseudocode. Introduction to QBASIC programming: Symbols, keywords, identifiers, data types, operators, control structure, functions, procedures. Array: 1-D, and multi-dimensional arrays. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, random access files.

GEC216 - General Engineering Laboratory 1 (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to Electrical Engineering, Materials Science, Applied Mechanics, Applied Computer Programming I and Workshop Technology Courses.

GEC217 - Engineer-In-Society I (1 Unit)

Science, Technology and Development: Ethical concepts of development. Indicators of development and the role of science and technology. The contribution of the Government to the process of development and the Nigerian experience in the process of economic development (Nigerian Five Year Development Plans, successes and setbacks). Limits of growth, appropriate technology and a new world of science and technology. Science, Technology and Society: The inter-relationship of social ethics and values, and science and technology. Societal needs and resources in the genesis and development of science and technology. Social problems, impact assessment, and control of science and technology. Responsibilities of engineers. Science, Technology and Environment: Disruption or enhancement of environmental quality through harmful or sound science and technology in relation to air, space, water, land, populations, agriculture, industry, wild life, human settlements, culture, education, etc. Ethics and Professionalism: Theistic and secular concepts of personal, social and professional ethics. Codes of conduct of engineers. Motivation, control, responsibility, rewards and accountability of engineers and development of an ethical engineering professionalism. Council of Engineers and Engineering Societies.

GEC218 - Workshop Technology (2 Units)

Introduction to engineering workshop practice covering mechanical, electrical, information engineering, civil, chemical, and petroleum engineering. Use of hand tools, and safety measures in these fields.

Omega Semester

GEC220 - Engineering Mathematics II (2 Units)

Partial Differentiation: Functions of several variables, continuity and partial derivatives. Total differentials, approximate calculations using differentials. Chain rule. Implicit differentiation. Series representation of functions, (Maclaurin's and Taylor's) Taylor's Theorem. Extremum problems, without and with constraints, Lagrange multipliers, global extremum. Ordinary Differential Equations: Definition, degree, order, linear, non-linear, solution. First order equations, separable variables, equations reducible to separable form, exact equations, integrating factors, linear equations. Linear differential equations with constant coefficients, homogeneous, non-homogeneous, complementary functions, particular integrals, D-operator method. General linear second-order differential equations (without using matrices).Power series solution, Legendre's differential equation.

GEC221 – Thermodynamics (2 Units)

Basic concepts, quantitative relations of zeroth, first, second and third laws of thermodynamics. Behaviour of pure substances and perfect gases. Ideal gas cycles.

GEC222 - Computer Aided Design and Manufacture (2 Units)

AutoCAD: principle and use of autocad. Electronic drafting and use of autocad in electrical, electronic, computer & communication engineering design. System's manual writing, component assembly instruction manual preparation. Oral Communication: Public speaking skills with effective use of visual aids and statistical and technical information. Principles of effective communication in interpersonal and mass communication

process. Effective reading skills-extracting main ideas and reading for specific information through speed reading. Written Communication: Principles of technical writing.

GEC223 - Fluid Mechanics (2 Units)

Properties of fluids. Fluid statics. Density, pressure, surface tension, viscosity, compressibility, etc. Basic conservation laws, friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamics similitude, principles of construction and operation of selected hydraulic machinery. Hydropower systems.

GEC224 - Strength of Materials (2 Units)

Forces, moments. Equilibrium of simple structures and machine parts. Kinematics of particles and rigid bodies. Newton's laws. Kinetic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature change. Stress circle. Deflection of beams. Shear forces and bending moments. Analytical and graphical methods for structures.

GEC225 - Applied Computer Programming II (2 Units)

Review of QBASIC and Introduction of Visual BASIC, Comparison of QBASIC and VBASIC. Creating applications. VBASIC Integrated Development Environment. Menu Design, Use of Procedures, Functions, Subroutines, and Event Procedures. Opening and Saving Pictures to folders. Writing to and Reading from files e.g. Notepad, Ms Word. Writing to and Reading from Database e.g. Access. Writing to and Reading from Text and database over the NET, Printing. Multimedia with VB: Sound, Music, and Video, Animation with VB. Calling other Applications from VB (Shell execute), html, pdf, .doc, files.

GEC226 - General Engineering Laboratory II (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to electrical Engineering, Materials science, Applied Mechanics, Applied computer Programming I and Workshop Technology courses.

GEC227 - Electrical Measurements and Instrumentations (2 Units)

Instrument systems including transducers, signal conditioners, and read out devices. Oscilloscope, recorders, bridges. Measurement of voltage, current, resistance, impedance, frequency, phase difference, electric power, energy, force, displacement, temperature, flow, pressure, and other engineering parameters.

GEC228 - Introduction to Electrical Engineering II (2 Units)

Analysis of Magnetic circuits, Hysteresis and eddy currents, three phase circuits, three-phase power measurement, Transformer theory; short-circuit and open-circuit tests, voltage regulation, efficiency. Electrical machines; constructional features and operation of dc generators and motors; single-phase and 3-phase motors and generators, electric energy utilization for lighting and heating. Tariffs.

GEC229 - Student Work Experience Programme (SWEP) (0 Unit)

Introduction to practices and skills through supervised hands-on workshop exercises in computer engineering and information & communication technology, and related general engineering. These exercises include familiarisation with basic tools, soldering and desoldering skill of pass-through & surface mount components, building of simple electronic circuits, troubleshooting of electronic devices, digital systems, etc. Use of hand drill. Safety precautions in handling electronics devices. Basic welding skill.

300 Level

Alpha Semester

GEC310 - Engineering Mathematics III (3 Units)

Matrices and Determinants: Matrices, some special matrices, matrix operations. Determinants and some useful theorems. Laplace's development. Solution of system of linear equations by determinants. Linear dependence and independence, rank of a matrix. General system of linear equations, existence and properties of solution, Gaussian elimination. Matrix inverse by elementary matrices, adjoint, and partitioning methods. Characteristic polynomial, characteristic equation, eigenvalues and eigenvectors. Diagonalization of matrices, application to system of first order linear differential equations. Multiple Integrals: Iterated integrals, multiple integrals over elementary regions. Change of variables, Jacobians. Differentiation of integrals involving a parameter, Leibniz's rule. Vector Algebra: Vector field, gradient and directional derivative, divergence, curl. Line and surface integrals, Stoke's theorem. Volume integrals, divergence theorem. Orthogonal transformations, scale factors, basis vectors. Cylindrical and spherical polar coordinate systems, gradient, divergence and curl in these systems. Fourier Series: periodic functions, trigonometric series. Fourier coefficients, Parsevals theorem, Functions of arbitrary period, even and odd functions. Half range expansion. Complex form of Fourier series. Integral Transform: Derivation of transforms and inverses (Fourier and Laplace). Applications of these transforms in boundary and initial value problems. Z transforms. Partial Differential Equations: Elementary properties of Gamma, Beta, Error, Bessel functions and Legendre polynomials. Basic concepts of partial differential equations. Classification of 2nd order linear partial differential equation into basic types. The principle of superposition. The wave, diffusion and Poisson's equations. Boundary and initial-value problems. D'Alembert's solution for wave equation. Method of separation of variables. Biharmonic equation.

EIE311 - Electromagnetic Fields and Waves (3 Units)

Review of Vector Algebra & Calculus: Scalar product and vector product, coordinate systems, gradient, curl, divergence operations. Gauss's, Stokes, Hemholtz and Green's integral theorems, integral of scalar and vector fields. Electrostatics: Charge and charge density. Coulomb's Law. Concept of fields. Electric flux density and electric field intensity. Gauss's Theorem and applications. Voltage and electric potential. Conductor, dielectrics. Polarization, susceptibility, permittivity. Electrostatic boundary condition. Capacitance calculation and electric energy. Magnestostatics: Current and current density. Magnetic dipoles and current loops.

Magnetic flux density and magnetic field intensity. Biot-Savart Law and Ampere's Law, Faraday's Law. Magnetostatic boundary condition. Self and mutual induction. Inductance calculation and magnetic energy. Maxwell's Equations: Time Varying fields : Faraday's Law of Induction, the conservation of charge and the incompleteness of Ampere's Law. Maxwell's equations and Lorentz force law. Uniform plane waves and wave equation. Time harmonic fields. Polarization of waves. Poynting's Theorem and the conservation of energy, the field definitions of impedance, admittance. Phase and group velocities. Waves in media: lossy media, dispersive media. Wave Propagation and Transmission Theory: Boundary conditions. Reflection and refraction at plane interface (normal and oblique angles), transmission line analogy. Transmission line theory: differential equations for a general transmission line, low loss and lossless lines, impedance characteristics of lines with various terminations, simple mismatch problems and the use of Smith Chart. Introduction to Waveguides and Cavity Resonators.

EIE312 - Communication Principles (3 Units)

Principles of Communications: An elementary account of the types of transmission. Brief historical development on communications: telegraph, telephony, radio, satellite, data, optical and mobile communications, facsimile. Block diagram of a communication system. The frequency spectrum. Signals and vectors, orthogonal functions, Fourier series, Fourier integral, signal spectrum, convolution, power and energy, correlation. Reasons for modulation. Types of modulation. Amplitude modulation systems: Comparison of AM systems, Methods of generating, and detecting AM, DBS, SSB signals. Vestigial sideband. Frequency mixing and multiplying, frequency division multiplexing, applications of AM systems. Frequency modulation systems: Instantaneous frequency, frequency deviation, modulation index, Bessel coefficients, significant sideband criteria, bandwidth of a sinusoidally modulated FM signal, power of an FM signal, narrowband FM, direct and indirect FM generation, various methods of FM demodulation, discriminator, phase-lock loop; limiter, pre-emphasis and de-emphasis, stereophonic FM broadcasting. Noise waveforms and characteristics. Thermal noise, shot noise, noise figure and noise temperature. Cascade network, experimental determination of noise figure. Effect of noise on AM and FM systems. Block diagram of a superheterodyne AM radio receiver, AM broadcast band and specification, signal sensitivity, aerial circuit, i.f. trap, RF amplifier design, frequency mixer, local oscillator design, inter modulation interference, adjacent channel interference, ganging, tracking error, intermediate frequency, automatic gain control, delay agc, diode detector, volume control. FM broadcast band specification, block diagram of a FM radio receiver, limiter and ratio detector, automatic frequency control, squelch circuit, FM mono and FM stereo receivers. AM broadcast band and specification. FM broadcast band and specification. Image frequency. FM mono and FM stereo receivers. TV broadcast band and specification. Signal format, transmitter and receiver block diagrams of Black and White TV and Color TV.

EIE313 – Physical Electronics (2 Units)
Free electron motion in static electric and magnetic fields, electronic structure of matter, conductivity in crystalline solids, theory of energy bands in insulators, semi-ion-conductors and conductors: electrons in metals and electron emissions, carriers and transport phenomena in semi conductors, characteristics of resistors, diodes, transistors, photocells and light emitting diodes. Elementary discrete devices fabrication techniques and IC technology.

EIE314 - Electric Circuit Theory I (3 Units)
Electric fields: Fundamental concepts, energy storage. Magnetic fields: Fundamental laws, field calculations, and energy storage. Magnetic circuits: simple calculation of magnetic circuits, B – H curves and core losses. Inductance: Self and mutual inductance, coupled circuits. Transient and steady state response of circuits: RL, RC, RLC circuits, free and forced oscillation. Network analysis: network theorems; mesh and node analysis. One and two – port network: driving point functions, circuit parameters, interconnection and termination, transformation.

EIE315 - Electrical Machines I (3 Units)

Electromechanical energy conversion: Law of conservation of energy. General energy balance equation. Singly excited system (induced voltage, electrical energy and torque equations). Double excited system (electrical energy, induced voltage and torque equations) DC Machines: principles of operation construction simple armature windings-lap and wave. Emf equations. Commutation. Armature reaction DC Generators: methods of excitation (separate series, shunt and compound) conditions for self excitation of shunt generators. Parallel operation of d.c. generators. Characteristics of d.c. generators. D.C. Motors: methods of excitation (separate series, shunt and compound characteristics of D.C motors. Derive expression for torque developed in D.C motors. D.C motor starters speed control (varying the armature voltage varying the field magnetic flux, ward Leonard method) variable and constant losses in D.C. machines. Determining efficiency of D.C machines by Direct loading method, swinburnes method, Hopkins test. Conditions for maximum efficiency of D.C machines. Transformers: construction of single phase transformers. Principle of operation. Drawing phase diagrams for transformers on no-load and on load, "An Ideal transformer, deriving an expression for the turn ratio of a transformer. Emf equations of transformers, approximate equivalent circuit, efficiency voltage regulation. Three phase transformers: Construction grouping and connection of windings parallel operation. Conditions for parallel operation , testing of transformers, list different types of transformers – power, distribution autotransformers, current and voltage transformers. Methods of cooling tap changing. Tests on transformers.

EIE318 - Laboratory Course I (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from courses taught in this semesters. Report on each experiment is to be submitted immediately after the laboratory period for grading.

Omega Semester

GEC320 - Numerical Methods (2 Units)

Numerical Methods: Finite difference. Interpolation. Numerical differentiation and integration. Numerical solution of ordinary differential equations, Trapezoidal, Simpson, Runge Kutta methods. Newton Raphson method for roots of equations. System of simultaneous linear equations. Linear simultaneous equations, Gaussian elimination, Gauss-Seidel iterative method, Jacobi Method, evaluation of determinant and inverse matrix. Eigensystem analysis: system stability, eigenvalue sensitivity, stability of Gauss-Seidel solution, amplitude and time scaling for model studies. Use of numerical analysis software packages to solve simple engineering problems.

GEC321 – Engineer-in-Society II (1 Unit)

Introduction to engineering economy and law for engineers.

GEC324 - Technical Communications (1 Unit)

Introduction to Communications: Principles of effective communication in interpersonal and mass communication process. Verbal, graphical and numerical communications. Written Communication: Principles of technical writing. Types of technical writing, referencing and citation. Styles of writing. Graphs; diagrams presentation. Statistical information presentation. Macro level, and micro-level. Oral Communication: Public speaking skills, multi-media presentation skills. Facilitator and participant skills in meetings. Negotiating skills. Idea-generating skills. Manuscript speaking and presentation involving media and telecommunications. Reading skills: Effective reading skills: extracting main ideas and speed-reading, chunk/cluster-reading and word-attack techniques of technical reading materials. Equipment Manual Writing and Presentation: Component diagrams, assembling, description, and multi-language presentation. Basic troubleshooting information, and technical support information. Marketing strategy.

EIE321- Introduction to Power Systems (2 Units)

Overview of power system. Single-phase and three-phase power calculations. Simple models of generators and transformers. Calculation of inductances of single-phase and three-phase lines. GMR and GMD. Bundled conductors. Calculation of capacitance of single-phase and three-phase lines. Current and voltage relations: Short, medium and long lines. Network equations and calculations: Power system components and equipment: Transformers, fuse cut outs, lightning arresters, voltage regulators, capacitors, switches, circuit breakers, reclosers, insulators, etc. Tariff and power factor improvements.

EIE322 - Signals and Systems (2 Units)

Continuous and discrete signals: transformations and inverse transformations, spectral analysis of steps, ramps and impulse, signal description by impulse and step functions. The independent variables: definition of rise time, settling time, overshoot, period magnitude and duration of a signal. Fourier analysis: periodic and non-periodic signals; Perseval theorem. Devices and models: network analysis and circuit with independent and dependent sources. Time invariant and stationary systems.

EIE323 - Analogue Electronics (3 Units)

Review of single stage transistor amplifiers using BJTs and FETs. Equivalent circuit and calculation of current gain, voltage gain, power gain, input and output impedance. Operational Amplifiers: Parameters and applications, Feedback, Broadband and narrow band amplifiers. Power amplifiers, voltage and current stabilizing circuits, voltage amplifiers, multi-0stage amplifiers using BJT and FETs.

EIE324 - Electric Circuit Theory II (3 Units)

Laplace transform methods in circuits analysis, transfer functions, pole – zero analysis, graphical representation. Basic state variable approach. Filter: rectifier filter. LC filters, K - & M – derived filters, frequency response. Network graphs and topology: basic concepts, application to non – planar networks. Waveforms and harmonics: Fourier analysis,

approximate harmonic analysis, circuits with non – sinusoidal excitation. Symmetrical components: Basic concepts and simple application.

EIE325 - Use of Engineering Packages (1 Unit)

Practical hands-on proficiency in the use of engineering packages for analysis, design, and simulation such as MATLAB, PSPICE, etc. It is a computer laboratory course.

EIE326 - Software Development Techniques (2 Units)

Engineering practices for the development of non-trivial software-intensive systems including requirement specification, Software architecture, implementation, verification and maintenance. Iterative development. Recognized standards, guidelines and models. Flowchart ANSI symbols and usage. Extensive examples, and exercises using pseudo-code/flowchart to solve practical problems in engineering. Debugging and documentation techniques. Programming using a structured language such as C: Symbols, keywords, identifiers, data types, operators, various statements, operator precedence, type conversion, conditional and control structures, function, recursive functions. Arrays: 1-D, and multi-dimensional arrays, passing elements or whole array to a function. Simple sorting and searching on arrays, pointers, strings, dynamic memory allocation. Structures and Unions: Structure declaration and definition, accessing structures, array of structures, pointers and structures, union declaration, enumerated variables. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, random access files. Advanced Topics: Command line parameters, pointers to functions, creation of header files, stacks, linked lists ,bitwise manipulation. Software development in C in MS Windows , UNIX/LINUX environments, header file, preprocessor directives, make, Makefile. Static and dynamic linking libraries. Extensive examples, and exercises programming in C to solve practical problems in engineering. Exercises are to be done in the Computer Laboratory.

EIE327 - Digital Electronics (3 Units)

Number Systems and Code. Logic Gates. Simplification of Logic Expressions using Boolean algebra. Simplification of Logic expressions using Karnaugh Maps. Combinational Logic Circuit Design Analysis and Synthesis. Algorithms for deriving minimal SOP forms from K-maps. POS form using K-maps. Algorithms for deriving minimal POS forms from K-maps. Computer-aided minimization of switching functions. Digital vs. analog systems. Mixed signal design, analogue and digital grounding. Digital system design hierarchy. Logic devices : TTL and CMOS families, technology, applications, signal levels, mixing, and interfacing. Interference and noise. Memory devices. Latches, Flip-flops. Sequential Logic Design: Counters, Registers. Timing circuits. Modular Design. Decoders. Decoder Circuit Structures. Implementing Logic Functions Using Decoder. Encoder Circuit Structures. Multiplexers/Data. Selectors. Multiplexer Circuit Structures. Applications of Multiplexers. Demultiplexers/Data Distributors. Arithmetic Circuits: Half Adder/Subtractors Full Adders/Subtractors. Comparators. Arithmetic Overflow Detection. Design Example: A Computer Arithmetic Logic Unit. Computer-aided Design of Modular Systems.

EIE328 - Laboratory Course II (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from courses taught in this semesters. Report on each experiment is to be submitted immediately after the laboratory period for grading.

400 Level

Alpha Semester

GEC410 - Probability and Statistics (2 Units)

Probability and Statistics: Probability space, theorems. Conditional probability and independence. random variables, discrete and continuous distributions, mean and variance. Bernouli, Binomial, Poisson,

hypergeometric, exponential, normal distributions and their characteristics. Examples of experimental measurement and reliability. Elementary sampling theory for normal population. Central limit theorem. Statistical inference (point and interval estimation and hypothesis testing) on means, proportions and variances. Power and operating characteristics of tests. Chi-squares test of goodness of fit. Simple linear regressions.

EIE411 - Computer Organisation and Architecture (3 Units)

Computer Fundamentals: Development history of computer hardware and software. Hardwired vs stored program concept. Von-Neuman architecture. Havard architecture: principle of operation, advantages, disadvantages. Single address machine. Contemporary computers. Computer system: block diagram, functions, examples, dataflow, control line. Computer Arithmetic: integer arithmetic (addition, subtraction, multiplication, division), floating-point representation (IEEE), floating-point arithmetic. arithmetic and logic unit (ALU). Introduction to CISC and RISC architecture: principle of operation, merits, demerits. Storage and Input/Output Systems: Computer function (fetch and execute cycles), interrupts, interconnection structures (Bus structure and bus types), Overview of memory system, memory chip organization and error correction, cache memory, memory storage devices. Overview of I/O, programmed and interrupt-driven I/Os, DMA, I/O channel and I/O processor. Control Unit: Micro-operations, control of the CPU, hardwired implementation, control unit operation, micro-instruction sequencing and execution, micro-programmed control. Use INTEL family, and MOTOROLA family as case study of a CISC computer system. Instruction Set and Register: Machine instruction characteristics, types of operands and operations, instruction functions, addressing modes, instruction formats, register organization, instruction pipelining. High performance computer systems: Techniques to achieve high performance, pipelining, storage hierarchy, units with function dedicated for I/O. RISC, introduction to superscalar processor, parallel processor. Use popular RISC processor (e.g. i960, Motorola PowerPC) as case study.

Operating System:

Overview of operating system, dimension and type of operating system, high level scheduling, short-term scheduling, I/O scheduling, memory management, virtual memory, UNIX/LINUX operating system: architecture, commands, programming; window based operating systems (MS windows, X-window).

EIE412 - Control Systems (3 Units)

Introduction: definition, examples of control systems. Open-loop and closed-loop control systems. Review of Laplace and inverse Laplace transforms. System modelling: Signal flow graph, block diagram. Transfer function. Poles and zeros. Block diagram reduction using signal flow graph and block diagram reduction techniques. Mechanical, electrical and electromechanical systems. First and second order models, higher order models. Definitions of transient response parameters. Analysis of second-order system as prototype. Routh-Hurwitz stability criterion. Classification of systems based on steady-state characteristics, steady-state error coefficient. Definition of Root locus, Properties of root locus, sketching of root locus plots. Effect of open-loop zeros and poles. Root locus design concepts. Frequency response analysis and design: Bode diagram, Polar plot, Nichols plot. Nyquist stability criterion: non-mathematical description of Nyquist criterion, interpretation of stability. Relative stability - Gain and phase margins. Closed-loop frequency response analysis - M and N contours, Nichols chart. Compensation techniques: lag, lead and lag-lead compensation, PD, PI and PID controllers. Cascade compensation based on root-locus method. Introduction to Feedback compensation. Computer-aided design and analysis of control system.

EIE413 - Laboratory Course and Mini Project (1 Unit)

Laboratory investigations and group mini-projects in computer, Electrical & Electronics, and Information & Communication Engineering. The write-up report on the project is to be submitted for grading and defence by each group.

EIE414 - Design and Installation of Electrical and ICT Services (2 Units)

Electrical Installation: Introduction to Health and Safety at Work Act in Nigeria. Electrical safety. First aid. Electricity supply regulations. Lighting and Illumination: Luminous intensity and flux. Maintenance factor. Coefficient of utilization. Types of light sources. Calculation of lighting requirements. Glare. Stroboscopic effect. Installation Materials, cables, junction box, terminations, joints. Conduits and ducting. Truck and truncking. Electrical Installation design in domestic, commercial, and industry. Alarm and emergency systems. Earthing and Protection. Purposes of earthing. Faraday cage. Rod electrodes. Earth electrode resistance. Earthing system. Earth fault loop impedance. ICT services: NCC and FCC codes of practice and standards. Telecommunication design and installation: Satellite, VSAT, etc. Telephone design and installation. Computer networking design and installation. Wireless LAN design and installation. Preparation of Bill of Engineering Measurement Evaluation. Contract bidding. Consultancy.

EEE414 - Electric Power Generation and Utilization (2 Units)

Energy and Mankind: Importance of energy to mankind, Nigerian energy resources and demand, National energy policy, structure of electric power system, electric power development in Nigeria. Sources of Energy: Batteries and fuel cells, hydro, steam, gas, nuclear, etc. Utilizations: Energy utilization in lighting, heating, welding, electrolytic and electrometallurgical processes. Resistance, induction, eddy – current and dielectric heating. Arc furnaces. Resistance and arc welding, Extraction and refining of metals.

EEE415 - Electrical Machines II (2 Units)

Induction Motors: Production of rotating magnetic field, construction and operation. Synchronous speed, slip of the rotor equivalent circuit, deriving expressions for: Rotor copper losses, load input to rotor, gross mechanical output. Torque equations, Toque/speed characteristics circle diagram. Squirrel cage and wound rotor induction motors. Starting methods for induction motors speed controls by: plugging, frequency changing, slip power recovery. Single phase induction motors – split phase, shaded pole, capacitor and series motors. Linear induction motors, stepper motors selsyn, tachogenerator. Schrage motor enclosures. Synchronous machines: construction Windings, emf equation and factors affecting it armature reaction – double armature reaction, synchronous reactance and synchronous impedance for asynchronous machine operating as a generator and as a motor. Voltage regulation, Parallel operation stating the conditions necessary. Synchronization short circuit ratio. Power diagram, zero power diagram, V-curves, power and torque equations, voltage and frequency control, methods of cooling. Synchronous motor: Method of operation starting method. Power factor correction.

EEE416 - Renewable Energy (1 Unit)

Introduction: Definition, sources, availability, quantity, advantages and disadvantages. Solar, Wind, Water, Biomass, Tidal and waves, and Geothermal Sources. Integration into the existing power grid. Transducers and System design. Cost-effectiveness, safety and health hazards. Socio-economic issues.

EEE417 - Power Electronics (2 Units)

Overview of Power Semiconductor Switches: Power diodes, Thyristors, Power MOSFET, G.T.O., IGBT, Field controlled switches (SiT and SiTH), Comparison of Semiconductor Switches, Desired Characteristics in Controllable Switches, Drive and Snubber Circuits. Line-Commutated Diode Rectifiers: Uncontrolled rectifier, Single-Phase Diode Bridge Rectifiers, Three-Phase Full-Bridge Rectifiers, Inrush Current and Over-voltages at Turn-On, Line-Current Harmonics and Power Factor, Phase-Controlled Rectifiers and Inverters. DC-DC Switch-Mode Converters: Basic Topologies, Buck converter, Boost converter, Buck-Boost Converter, Flyback Converter. Switch-Mode DC-AC Inverters: Pulse-Width Modulation, Single-Phase Inverters, Three-Phase Inverters, Effect of Blanking Time on Output Voltage in PWM Inverters. Resonant Converters: Classification of Resonant Converters, Basic Concepts, Load-Resonant Converters, Resonant-Switch Converters. Power Supply:

Switching Power Supplies, Electrical Isolation, Protection Circuits, Power Supply Specification, Power Line Disturbances, Power Conditioners, Uninterruptible Power Supplies.

EIE418 - Data Communications and Computer Network (3 Units)
Interfacing: Interfaces for simple computer system and terminal to terminal. MODEM, terminal interfaces, CCITT V.24/RS-232, CCITT V.28, V.35, GPIB, EIA, RS-232C standard, speed and distance limitations for V.24, RS-232C, RS-449/422/423 interfaces and standards. Channel Coding and Error Control: Forward Error Control; Error Detection Methods; Parity Checking; Linear Block Codes, Cyclic Redundancy Checking; Feedback Error Control. Digitalisation: Sampling theorem, Shannon theorem, PCM and Quantisation Error; Multiplexing, FDM, TDM; Higher order multiplexing; Frame formatting, time-slot.Digital Modulation Techniques: Line coding, intersymbol interference, Nyquist wave shaping, eye pattern, adaptive equalization. Transmission over bandpass channel. ASK, FSK, PSK, DPSK, M-ary modulation, continuous phase FSK, MSK, QAM, DSL Schemes. Spread Spectrum Communications: Pseudo noise sequences, direct sequence spread spectrum, frequency hopping spread spectrum, CDMA, application examples. Telephony: The telephone set and subscriber loop interface, basic function of the telephone set, cordless telephone, local loop, line characteristics and conditioning. Public switched telephone network, hybrids, echo suppression. Central office switching system.Digital Switching: Digital Switching Systems, Space Switching, Time Switching Module; Time-Space-Time Switch Structure, Circuit switching networks; Packet switching networks; X.25 packet switched networks. ISDN interfaces and functions: Transmission structure, user-network interface configurations, ISDN protocol architecture, connections, addressing. Physical layer. Data link layer, network layer. Frame Relay: Background. Protocols and service. Frame-mode protocol architecture, frame-mode call control, Frame relay congestion control: Traffic rate management, explicit congestion avoidance and implicit congestion control. ATM: Virtual channels and virtual path. ATM protocols, transmission of ATM cells, ATM adaptation layer. AAL

services. Traffic and congestion control. Latency/speed effect, cell delay variation. Network resource management, connection admission control, usage parameter control, priority control. Cellular Mobile Network: 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. Call Processing and Signalling: Roaming and mobility management; Traffic engineering and performance issues, call set up and hand-offs; Capacity planning; Factors affecting economical network designs.

Omega Semester

GEC429 - Students Industrial Work Experience (SIWES) (6 Units)

During the SIWES, each student will undergo a practical on the job training in engineering industry approved for its relevance to the student's major for a minimum of 28 weeks starting immediately after the first semester examinations at 400 level. A programme of training will be drawn by the College and the Industry for each student, and a prescribed log book with daily recording of the student activities is to be kept by each student and appropriately signed. At the end of the programme, a written report is to be submitted to the college and each student to present a seminar on his/her industrial experience. Each student must pass a prescribed certification examination during the industrial training.

500 Level

Alpha Semester

EIE510 - Research Methodology (1 Unit)

Definition of Research, Charateristics of Research, Types of Reseacrh, The Reseacrh Process,Formulating the Reseacrh Problem,Considerations in Selecting a Reseacrh Problem, Reviewing the Literature, Procedure for reviewing the Literature, The Formulation of Objectives, Preparing the Reseacrh Design, Consideration for the Research Design,Guidelines to construct a Research tool,Constructing a Questionnaire, Piloting the Questionnaire,Collecting Data, Ethical Issues concerning reseacrh participants, Ethical Issues relating to the researcher,Processing and Analyzing Data, The Data Processing Operations, Data Analyzing methods,Generalization and interpreation of the Results, Reporting the Findings, Written Research Project Report Format,General Attributes of a Reseacrh Proposal, What distinguishes an Engineering Reseacrh Proposal, Components of a Reseach Proposal,Costing an Engineering Reseacrh Proposal.

EIE511 - Project Management (2 Units)

Management Concepts. Project organization, teams, methods and tools for project management. Organization 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. Quality measurement.

EIE512 - Systems Reliability and Maintainability (2 Units)

Introduction to reliability, maintainability, reliability specification and metrics. Application to computer hardware system, communication equipment, power systems, electronic components. Basic maintenance types, and procedures for computers and digital communication systems. Fault troubleshooting techniques. QoS and time of availability of data communications. Quality control techniques. Design for higher Metrics, fault avoidance, fault tolerance, programming for reliability, software safety and hazard analysis. Comparison of hardware and software reliability. Software Quality and Assurance: definition of software quality, software quality factors, quality control, cost of quality , quality assurance.

SQA activities, formal technical reviews, software quality metrics, statistical quality assurance. ISO 9000 Requirements and certification, ISO 9000-3 for software quality process, process documentation, quality audit. Capability Maturity Model: Software Engineering Institute, levels of maturity, key process areas, Comparison between ISO 9000 Standards and CMM. Ensuring Quality and Reliability: verification and validation, measurement tracking and feedback mechanism, total quality management, risk management.

EIE513 - Cyberpreneurship and Cyber Law (2 Units)

Introduction: Definition of creativity, innovation, examples of creativity leading to innovation, commercialization of creative and innovative ideas. Trends in technology development. Entrepreneurship management and ownership. Characteristics of entrepreneur, starting a new business, business planning, strategic planning and management, site selection and layout. Establishing new venture, risk management. Business Plan Development: definition, need, preparation of business plan. Forecasting developments and charting an action plan. Identifying the product/service, market research and feasibility study. Financing business. Sources of debt financing. Creating the marketing plan, pricing, creative advertising and promotion. Entrepreneurship case studies: Overview and analysis of successful entrepreneurs such as Bill Gates, Michael Dell, David Filo and Jerry Yang of Yahoo, etc. Nigerian entrepreneurship. Discussion of Nigerian business environment, and illustrated with successful Nigerian entrepreneurs. Overview of the Nigerian Legal System: Civil and criminal. Basic concepts of law. Contract Law. Current issues: digital signatures, intellectual property and copyright. Speech Law: Defamation, Sedition, Printing Press Act. Speech on the Internet. Advertising Code: Made in Nigeria rules and guidelines, Advertising standards. Media and Licensing law in Nigerian: Developing an in-depth understanding of the nature and function of Nigerian cyber law. Public and private licensing. Intellectual and moral rights. Music royalties, synchronization rights, performance rights. Role of music publishers. Broadcast rights, merchandising. Detailed analysis of

Communications and Multimedia Act. Ethic and Etiquette: New codes of social behaviour: the right to privacy.

EEE510 - Control Engineering (3 Units)

Nonlinear control systems: Introduction, common nonlinearities. Phase plane method- basic concepts, plots, singular points, stability, and system analysis, limit cycle. Describing function method-concept, derivation of describing function, stability analysis, jump resonance. Liapunov and popov stability criteria. State Variable analysis and design: introduction, concept of state, state variable representation, state models for continuous time systems, diagonalisation, solution of state equations. Controllability and observability. Pole placement by state feedback. Root loci. Inverse Nyquist array. Optimal control: introduction, problem statement, parameter optimization. Optimal control problem: Transfer function method, state variable method. State regulator problem. Sampled Data control system: Introduction, spectrum analysis of sampling process, difference equation. State variables of discrete control system. Z-Transfer Function, response, and analysis. Response between sampling instants. The z- and s-domain relationship. Stability analysis and compensation design. Computer-aided design and analysis. Sequence control design using PLC.

EEE511 - Electrical Power Systems (3 Units)

Basic Concepts: Review of basic concepts of three-phase power and reactive power flow. Single line and reactance diagram of power systems. Per-unit representation. An overview of power system. Load Flow Analysis: Representation of power system. Bus admittance matrix. Power flow equations. Power-flow solutions by Gauss-Seidel and Newton-Raphson methods, Sparcity Techniques, Decoupled and fast decoupled methods. Symmetrical and Unsymmetrical Faults: Transients in series R-L circuit. Internal voltages of loaded machines under fault conditions. Symmetrical fault analysis, Z-bus and fault analysis using Z-bus. Symmetrical components, Sequence networks. Unsymmetrical faults: single line- to- ground fault, line- to- line fault and double line-to-ground fault. Stability studies. Principles of power system protections.

Deregulated Power Systems: Historical Development, Technical, economic, and regulatory issues; Challenges in decentralized control of power systems, Optimal power flow tools applied to deregulated electric power industry, transaction management system (TMS, Congestion management, Nigerian Power Systems and Deregulation.

EIE515 - Digital Signal Processing (3 Units)

Introduction: Advantages of digital over analogue signal processing, problems of digitization, overview of application of DSP, basic elements of DSP system. Digital Processing of analogue signals: Sampling of analogue signals, sampling theorem, aliasing, quantization, noise, and coding, types and selection of ADC/DAC, Sigma-delta ADC. Analytical tools: z-transform, properties, transfer function, inverse z-transform, z-plane poles and zeros, analysis of linear time-invariant in z-domain, system stability. Discrete Fourier Analysis: Discrete Fourier Transform and properties, inverse DFT, truncated Fourier transform, windowing, FFT algorithms. Discrete Time Signals & systems: Discrete time sequences (signals), classification and determination of discrete time system, discrete time i/o description (difference equation), solution of difference equations, convolution, correlation, impulse response. Digital Filters: Definition and types. FIR filters: Transfer function, characteristics, applications, design methods, Gibb's effect and elimination, fir filter realisation. IIR filter: Transfer function, characteristics, applications, overview of analogue filter design techniques, design methods-conversion from analogue to digital filter design techniques, IIR filter realization. Structure of Discrete Time System: Block diagram representation of constant coefficient difference equations, IIR and FIR systems and their basic structures, stability of discrete time systems. Software implementation of dsp algorithms. DSP Microprocessors: Architecture, fixed point vs floating point DSP, Finite word length effects. DSP chips: interfacing and programming. Practical application of DSP in audio, and video.

EIE517 - Applied Electronics (2 Units)

Radio Frequency Amplifiers: Resonance, Circuit Q and Bandwidth, Small-Signal RF Amplifier Design, Coupling Tuned Circuits, Transformer Coupling, Double-Tuned Circuits, IF Amplifiers, Ceramic Filters, RF Power Amplifiers, Neutralization, Impedance Matching Networks. S-Parameter Theory and Applications: Properties of S Parameters, Power-Gain Equations, Amplifier Stability, Constant-Gain Circles, Constant Operating Power-Gain Circles, Constant-Noise-Figure Circles. Small-Signal and Narrowband Amplifiers: DC Biasing Circuits, High-Gain Amplifier, Low-Noise Amplifier. Balanced Amplifiers: Lange Couplers, Balanced Amplifier Design, Power-combining techniques. Large-Signal and Broadband Amplifiers: Large-Signal Amplifier, High-Power Amplifier, Low-Noise Amplifier, Broadband Amplifier, Feedback Techniques, .Distributed Amplifier. Microwave Oscillators: Oscillation Conditions, Oscillator Circuit Configurations, Tuning Circuits, One-Port Oscillator, Two-Port Oscillator, High-Power Oscillator, Broadband Oscillator. Phase-Locked Loop: Principle of operation, phase detector, voltage controlled oscillator, capture and locked range, Loop Frequency Response, Transient response, applications of PLL: frequency synthesis, pulse transmission synchronization. Video Bandwidth and Resolution, Transmitted Video and Audio Signals.

EIE519 - Project I (0 Unit)

Each student is required to undertake a project that gives productivity value to the academic knowledge gained in his\her field of study. The project shall involve problem solving using engineering theories and techniques, and the implementation of the project design. The student is expected to design a possible solution to the problem, taking into account various aspects such as professionalism, economy, costing, and engineering viability. At the end of the first semester, each student shall present a seminar on his/her project.

Omega Semester

EEE520 - Advanced Instrumentations (2 Units)

Revision of basics of measurement and instrumentation, Error in measurements, DC and AC bridges and their applications, Instrument transformers and applications in power systems, energy meters and metering, Electronic instrumentations: digital techniques, Analogue/digital signal processing (ADC/DAC), sample and hold circuits, electronic counters and their applications, Application of microcontrollers in digital instrumentation.

EEE521 - High Voltage Engineering (2 Units)

Generation of High Voltages and Currents: Generation of high D.C. voltages. Voltage multipliers. Van-de-Graff generators. Generation of high a.c. voltages: cascaded transformers and Tesla coil. Impulse voltages and currents. Control of Impulse generators. Breakdown Phenomena: Breakdown in electronegative gases. Tome lags for breakdown. Streamer theory of breakdown. Paschen's law. Breakdown in non-uniform fields and corona discharges. Conduction and breakdown in liquids. Breakdown in solid dielectrics: intrinsic breakdown, thermal breakdown and electromechanical breakdown. High Voltage Measurement and Testing: Measurement of D.C. resistivity. Dielectric constant and loss factor. Partial discharge measurement. Testing of insulators and bushings. Testing of cables, circuit breakers, transformers and surge diverters. Radio interference measurements. Over voltage. Phenomenon and Insulating Coordination: Lightning and switching surges. Basic insulation level. Surge diverters and arresters. Principles of insulation coordination on high voltage and extra high voltage power systems.

EEE522 - Electric Drives (2 Units)

Introduction: Definitions, advantages, disadvantages of electric drives. Classification: Group drives, individual drives, and multi – motor drives, advantages and disadvantages of each. Common types of motors used in electric drives: dc motors, induction motors, and synchronous motors. Selection of appropriate motors for electric drives: environmental considerations (temperature, humidity, dust, chemical, etc). Factors for selection – electrical, mechanical, size and rating and cost. Motor characteristics and applications: Torque/speed characteristics, Speed/time relationship. Braking, reversing, and regenerative actions. Dynamics of electric drives. Control of electric motors: dc motor drives, induction motor drives, and synchronous motor drives. Drives for specific applications: Textile mills, steel rolling mills, cranes and hoist drives, cement mills, sugar mills, machine tools, paper mills, coal mines, etc. Control techniques for electric drives: microprocessors and control of electric drives, Artificial Intelligent based Drives.

EEE523 - Industrial Electronics (2 Units)

Programmable Logic Controller: Introduction to PLC, PLC instructions, Timing and Counting, Closed-loop and open-loop control using PLC. Mechanical and Solid-State Switches: Mechanical Switches, Electromechanical Devices, Solid-State Switches: BJT MOSFET, UJT, SCR, TRIAC, Application examples. Transducers and Signal Conditioning Circuitry: Thermisters and Sensistors, Magnetic Proximity Sensors, Capacitive and Ultrasonic Level-Sensing Transducers, Pressure and Flow-Sensing Transducers, Force-Sensing Transducers, Signal Conditioning Circuitry for the above devices. Industrial Optoelectronic Devices: Industrial Light Sources, Photoconductive Cells, Photodiodes, Phototransistors, Optoisolators, Optocouplers, Interrupter Modules, Industrial Applications of light sensors, Bar Code and Bar Code Readers. Motors and Motor Control Circuitry: Review of ac and dc motors, Basic dc Motor Control Circuitry, Synchros and Resolvers, Brushless dc Servomotors, Stepper Motors, Motor Drive Circuitry.

EEE524 - Computers and Communications in Power Systems (2 Units)

Introduction to information theory. Basic communication principles. Basic digital communication. SCADA system. Power line Carrier (PLC) System. Communication modem. Telemeter and tele-billing. Revision of C/C++ or Java programming. Software development for power systems.

Simulation packages in power system. Software development exercises in power systems.

EEE525 - Physics and Technology of Semiconductor Devices (2 Units)

Physics and properties of semiconductor including high field effects, carrier injection and semi conductor surface phenomena, devices technology, diffraction technique, oxidation, diffusion, sintering; bulk and epitaxial material growth and impurity control, metal semiconductor interface properties, stability and methods of characterization\; Control and surface controlled devices. Discrete semiconductor devices and fabrication. Integrated circuit technology: Monolithic elements, fabrication and design. Scale of Integration: SSL, MSI, LSI, VLSI, super integrating photo fabrication metallization and encapsulation technique. Introduction to charge-couple devices and systems; Magnetic material devices, Techniques of making storage elements. Pressure devices technologies. Applications.

EIE528 - Digital Control Systems (2 Units)

Introduction: Advantages, and configuration. Concept of sampling: Nyquist sampling theorem, aliasing, multiple channel sampling, choice of ADC and DAC. Difference equation and solution. The z-transform: direct, transfer function, inverse transform methods, response of linear discrete system. Z-transform applications. Z-transform of sampling instants, zero-order-hold, Z and S plane relationship. Closed loop sampled data system, stability analysis. Finite word length effect. Digital PID algorithm and compensator design. Root locus of digital control system. Sequential control system design. State variable of dynamic system, solution of state equations, transition matrix, eigenvalues, eigenvector. SCADA system. CAD digital control system.

EEE529 - Introduction to Mechatronics (2 Units)

Definition and application of the synergy. Mechanical gear system, rack and pinion, worm and screw, and simple calculations. Electrical transformer as equivalent of mechanical gear. Analogue sensors: pressure, temperature, linear displacement, angular displacement, rate gyro, acceleration, light sensors, ir sensors, hall effect sensors. Motion detection. Digital sensors: heading sensor, gps, gsm, compass, digital infrared sensor, shaft encoder, and their interfacing. Actuators: DC motors, servo, stepper motor, ac motor, linear actuator, relays. Signal conditioning, introduction to adc and dac.

EIE529 - Project II (6 Units)

The project work is to be completed in this second phase. Each student is to submit a proper written report (bound 3 hardcopies, and a CD-ROM of electronic copy). The project is presented and defended at a seminar.

EIE520 - Artificial Neural Networks (2 Units)

Neural Network: Definition of artificial neural network. Similarities of neural network with 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 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. Engineering applications. ANN programming.

EIE525 - Fuzzy Logic and Programming (2 Units)

Introduction: fuzzy set theory, knowledge base problem, objective and subjective knowledge, crisp sets, fuzzy sets, linguistic variables, membership functions. Set theoretic operations, comparison between crisp sets and fuzzy sets. Law of Contradiction and Law of Excluded Middle, fuzzy intersection, union and complement, and other fuzzy operators. Fuzzy relations and compositions on the same and different product spaces. Max-Min composition, Max-Product composition, fuzzy relational matrix, sup-star composition. Hedges or modifiers of linguistic variables, fuzzy logic vs. probability. Fuzzy reasoning and implication, the fuzzy truth tables, traditional propositional logic and the rule of inference, the Modus Ponens and Modus Tollens, fuzzy modeling with causal IF-THEN statements. Fuzzy Models, fuzzy logic systems, combination of fuzzy basis functions, universal approximator, fuzzy neural network, fuzzy associate memory matrix, self-learning fuzzy systems. Fuzzy logic system applications. Fuzzy programming.

EIE526 - Digital Image Processing (2 Units)
Introduction: definition, problems, and applications of digital image processing. Digital image acquisition devices. Digital image formats. Edge detection techniques, segmentation methods. Image Morphology. Image enhancement. Image restoration techniques. Morphology. Fourier transform and Wavelet transform in image processing. Image registration techniques. Shape analysis. Image understanding. Artificial neural network and image understanding. Colour representation standards, equations, processing, quantization, and dithering. Case study: practical application of image processing to face recognition, fingerprint, iris, etc. Introduction to image compression techniques.

EEE526 - Electric Power Systems Planning and Design (2 Units)
Overall planning of power systems and design: Power systems equipment, selection and application, Economics generator sizes and site selection. Sub-station Designs: General requirements, electrical layout and specifications. Design of earthing systems. Overhead lines and underground cable design, Transmission and distribution system design, National and International regulations governing overhead lines. Reactive Power Planning. Flexible AC Transmission Systems (FACTS) and High Voltage DC links. Preparation of Bills of Engineering Measurement and Evaluation (BEME). Computer Aided Design of Power systems.

EEE527 - Electrical Machines Designs (2 Units)
Materials: conducting, insulating and magnetic material use in electrical machines. Magnetic circuit of rotating machines: Ampere turn calculations for dc, induction and synchronous machines. Design of transformers: core, and shell types, output equation and specific loading, design of core, yoke, winding and cooling systems, reactance calculations.

Design of dc machines: Main dimensions, pole field winding, armature winding, commutator, Design of induction and synchronous machines: main dimensions, stator and rotor. Design methods for machines; cooling methods, temperature rise, standard ratings.

EEIE 528 - Power System Operations and Control (2 Units)

Overview of power system operation and control: Basic objectives of security and economics in power system operations and control, main techniques currently used in the operation and control of power systems. Resource Scheduling and commitment: Unit commitment in power plants, fuel scheduling in thermal power plants, management of storage hydro – electric releases. Operation planning: Reactive power planning, PLC's, SCADA. Economic Operation of power systems: economic distribution of loads between plants, B coefficients and penalty factors, etc. Power system control: Automatic Generator Control (AGC), Real power and frequency control, voltage and reactive power control. Computer and expert systems applications in power systems.

5.2.3 INFORMATION AND COMMUNICATION ENGINEERING PROGRAMME

PROGRAMME: Information and Communication Engineering

DEGREE AWARDED: B.Eng (Honours) Information and Communication

DURATION: Five (5) Years (10 Semesters)

ADMISSION REQUIREMENTS

The minimum entry requirement for admission into the Department of Electrical & Information Engineering Undergraduate Programmes is O'Level SSCE/GCE/ NECO Credit level passes in five (5) subjects, including English and Mathematics, Physics, Chemistry, and either credit pass in Further Mathematics, Biology, or Technical Drawing. Candidates are also expected to sit for the Unified Tertiary Matriculation Examination (UTME) and attain the prescribed cut-off marks, in addition to passing the Covenant University Scholastic Aptitude Screening (CUSAS).

GRADUATION REQUIREMENTS

To graduate from the 5-year Bachelor of Engineering (B.Eng) Degree Programme in Information and Communication Engineering, students must have successfully completed a minimum of 215 Credit Units as shown below:

Graduation Required Units for B.Eng Information and Communication Engineering Programme

Level	Core/ Compulsory	Electives	SWEP	Industrial Training (SIWES)	College courses	University Courses	NUC Courses	Total
100	31					4	10	45
200	38		0			4	6	48
300	43					4	2	49
400	20			6		2		28
500	37	4				4		45
Total	169	4	0	6	0	18	18	215

COURSE STRUCTURE

100 Level Information and Communication Engineering

Course Grouping	Course Code	Course Title	Status	Credit Unit	Pre-requisite	Semester
Compulsory Courses	GEC117	Technical Drawing	C	2		α
	MAT111	Mathematics I: Algebra	C	3		α
	MAT112	Mathematics II: Trigonometry and Geometry	C	2		α
	PHY111	Mechanics and Properties of Matter	C	2		α
	PHY112	Heat, Sound and Optics	C	2		α
	PHY119	Physics Practicals IA	C	1		α
	CHM111	General Physical Chemistry	C	3		α
	CHM119	General Chemistry Practical I	C	1		α
	MAT121	Mathematics V: Calculus	C	3		Ω
	MAT122	Mathematics VI: Vector Algebra	C	2		Ω
	PHY121	Electricity and Magnetism I	C	2		Ω
	PHY122	Atomic and Nuclear Physics	C	2		Ω
	PHY129	Physics Practicals IB	C	1		Ω
	CHM121	General Organic Chemistry	C	2		Ω
	CHM122	General Inorganic Chemistry	C	2		Ω
	CHM129	General Chemistry Practical II	C	1		Ω
University Courses	EDS111	Entrepreneurial Development Studies I	V	1		α
	TMC111	Total Man Concept I	V	1		α
	TMC112	Total Man Concept - Sports	V	0		α
	EDS121	Entrepreneurial Development Studies II	V	1		Ω
	TMC121	Total Man Concept II	V	1		Ω
	TMC122	Total Man Concept – Sports	V	0		Ω
NUC General Courses	CST111	Use of Library, Study Skills and Information Communication Technology I	U	2		α
	CST121	Use of Library, Study Skills and Information Communication Technology II	U	2		Ω
	GST111	Communication in English	U	2		α
	GST121	Use of Library Study Skills and	U	2		Ω
	GST 122	ICT Communication In French	U	2		Ω
				α =22 Ω = 23 Total = 45 Units		

200 Level Information and Communication Engineering						
Course Grouping	Course Code	Course Title	Status	Credit Unit	Pre-requisite	Semester
Compulsory Courses	GEC210	Engineering Mathematics I	C	2	MAT122, MAT 123	α
	GEC211	Introduction to Electrical Engineering 1	C	2		α
	GEC212	Engineering Graphics	C	2		α
	GEC213	Material Science and Raw Material Studies	C	2		α
	GEC214	Applied Mechanics	C	3		α
	GEC215	Applied Computer Programming I	C	2	CST121	α
	GEC216	General Engineering Laboratory I	C	3		α
	GEC217	Engineer-in-Society I	C	1		α
	GEC218	Workshop Technology	C	2		α
	GEC220	Engineering Mathematics II	C	2		Ω
	GEC221	Thermodynamics	C	2		Ω
	GEC222	Computer Aided Design and Manufacture	C	2		Ω
	GEC223	Fluid Mechanics	C	2		Ω
	GEC224	Strength of Materials	C	2		Ω
	GEC225	Applied Computer Programming II	C	2		Ω
	GEC226	General Engineering Laboratory II	C	3		Ω
	GEC227	Electrical Measurements and Instrumentations	C	2		Ω
	GEC228	Introduction to Electrical Engineering II	C	2		Ω
SWEP	GEC229	Student Workshop Experience Programme (SWEP)	S	0		Ω
University Courses	EDS211	Entrepreneurial Development Studies III	V	1		α
	TMC211	Total Man Concept III	V	1		α
	TMC212	Total Man Concept – Sports	V	0		α
	EDS221	Entrepreneurial Development Studies IV	V	1		Ω
	TMC221	Total Man Concept IV	V	1		Ω
	TMC222	Total Man Concept – Sports	V	0		Ω
NUC General Courses	GST211	Logic, Philosophy and Human Existence	U	2		α
	GST221	Nigerian People and Culture	U	2		Ω
	GST222	Peace Studies and Conflict Resolution	U	2		Ω
				α =23 Ω = 25 Total = 48 Units		

__NOTE__: GEC229 (SWEP) is done during long vacatio

300 Level Information and Communication Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Credit Unit**	**Pre-requisite**	**Semester**
Compulsory Courses	GEC310	Engineering Mathematics III	C	3	GEC220	α
	EIE311	Electromagnetic Fields and Waves	C	3		α
	EIE312	Communication Principles	C	3		α
	EIE313	Physical Electronics	C	2	GEC228	α
	EIE314	Electric Circuit Theory I	C	3	GEC228	α
	EIE315	Electrical Machines I	C	3	GEC228	α
	EIE318	Laboratory Course I	C	3		α
	GEC320	Numerical Methods	C	2	GEC310	Ω
	EIE322	Signal and Systems	C	2		Ω
	GEC324	Technical Communication	C	1		Ω
	EIE321	Introduction to Power Systems	C	2	EIE315	Ω
	EIE323	Analogue Electronics	C	3	EIE313	Ω
	EIE324	Electric Circuit Theory II	C	3	EIE314	Ω
	EIE325	Use of Engineering Packages	C	1		Ω
	EIE326	Software Development Techniques	C	2	GEC225	Ω
	EIE327	Digital Electronics	C	3		Ω
	GEC321	Engineer-in-Society II	C	1		Ω
	EIE328	Laboratory Course II	C	3		Ω
University Courses	EDS311	Entrepreneurial Development Studies V	V	1		α
	TMC311	Total Man Concept V	V	1		α
	TMC312	Total Man Concept – Sports	V	0		α
	EDS321	Entrepreneurial Development Studies VI	V	1		Ω
	TMC321	Total Man Concept VI	V	1		Ω
	TMC322	Total Man Concept – Sports	V	0		Ω
NUC General Course	GST311	History and Philosophy of Science	U	2		α
				α =24 Ω = 25 Total = 49 Units		

400 Level Information and Communication Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Credit Unit**	**Pre-requisite**	**Semester**
Compulsory Courses	GEC410	Probability and Statistics	C	2		α
	EIE411	Computer Organization and Architecture	C	3	EIE326	α
	EIE412	Control Systems	C	3		α
	EIE413	Laboratory Course and Mini Project	C	1		α
	EIE414	Design and Installation of Electrical and ICT Services	C	2		α
	ICE414	Internet Technology and Programming	C	3		α
	ICE416	Random Processes and Queue theory	C	3		α
	EIE418	Data Communications and Computer Networks	C	3	EIE312	α
SIWES [Industrial Training]	GEC429	Student Industrial Work Experience scheme (SIWES) [Industrial Training]	S	6		Ω
University Courses	EDS411	Entrepreneurial Development Studies VII	V	1		α
	TMC411	Total Man Concept VII	V	1		α
	TMC412	Total Man Concept – Sports	V	0		α
				α =22 Ω = 6 Total = 28 Units		

500 Level Information and Communication Engineering						
Course Grouping	Course Code	Course Title	Status	Credit Unit	Pre-requisite	Semester
Compulsory Courses	EIE510	Research Methodology	C	1		α
	EIE511	Project Management	C	2		α
	EIE512	Systems Reliability and Maintainability	C	2		α
	EIE513	Cyberpreneurship and Cyber Law	C	2		α
	EIE515	Digital Signal Processing	C	3		α
	ICE510	Satellite Communications	C	3		α
	ICE511	Mobile Communication and Network	C	3		α
	ICE512	Antenna and Propagation	C	3		α
	EIE517	Applied Electronics	C	2		α
	EIE519	Project I	C	0		α
	ICE520	Broadcast Engineering	C	2		Ω
	ICE521	Microwave Devices and Measurements	C	2		Ω
	ICE522	Telecommunication Software Development	C	2		Ω
	ICE523	Information Theory and Coding	C	2		Ω
	EIE528	Digital Control Systems	C	2		Ω
	*EIE529	Project II	C	6	EIE 519	Ω
Electives	***Note: Select 4 credit units from the following electives:***					
	EIE520	Artificial Neural Network	E	2		Ω
	EIE521	Electromagnetic Interferences	E	2		Ω
	EIE522	JAVA Technology and Programming	E	2		Ω
	EIE523	Multimedia Technology andProgramming	E	2		Ω
	EIE524	Cryptography Principle and Applications	E	2		Ω
	ICE525	Computer Security Techniques	E	2		Ω
	EEE529	Introduction to Mechatronics	E	2		Ω
University Courses	EDS511	Entrepreneurial Development Studies IX	V	1		α
	TMC511	Total Man Concept IX	V	1		α
	TMC512	Total Man Concept – Sports	V	0		α
	EDS521	Entrepreneurial Development Studies X	V	1		Ω
	TMC521	Total Man Concept X	V	1		Ω
	TMC522	Total Man Concept – Sports	V	0		Ω
				α =23 Ω = 22 Total = 45 Units		

**EIE529 is a continuation of EIE519*

COURSE DESCRIPTION

100 level

Alpha Semester

GEC117 - Technical Drawing (2 Units)

Drawing Tools: Description, Uses and Maintenance, Line Work: Definition of points, lines and planes, Types of lines (Description, Uses), Dimensioning: Examples like arrow heads, solid dots and crosses; of straight lines, of circles, inadequate space dimensioning, Common Errors in line drawings, Lettering, Drawing Sheets Format, Border Lines and Title Block. Plane Geometry: Angles (Types and their construction), Triangles (Types and their construction), Quadrilaterals (Types and their construction), Polygons (Types and their construction), Circle and It's Parts, Inscribing and Circumscribing Circles, Tangents (Internal and External), Ellipse (Different Methods of construction), Plane and Diagonal Scales. Orthographic Projection: Basic Introduction: Description, Plan, Elevations, 1st Angle Projection, 3rd Angle Projection, Sectioning, Exercises.

MAT111 - Mathematics 1: Algebra (3 Units)

Algebra of Sets; special sets (NCZCRCC); theory of indices, law of logarithms, indical equations, surdic equations. Polynomials, the remainder and factor theorems; polynomial equations and inequalities- especially linear, quadratic and `cubic. Solving quadratic equation and cubic equations with an integral root. Domain and zeroes of rational functions. Partial fractions. Permutations and combinations. The binomial theorem for any index and applications. Sequences and series of real numbers (including AP and GP). Algebra of complex numbers. Introduction to m x n matrices; elementary operations on matrices and applications to solution of linear equations. Elementary properties of determinants of at most 3 x 3 matrices; The Rule of Sarrus.

MAT112 - Mathematics II: Trigonometry and Geometry (2 Units)
Trigonometric functions; exponential and logarithmic functions. Circular measure; hyperbolic functions. Equations of lines and planes; conic sections (circle, parabola, hyperbola, ellipse).

PHY111 - Mechanics and Properties of Matter (2 Units)
Units and dimensions, scalars and vectors, particle kinematics, Newton's laws, friction, work, energy, centre of mass, simple harmonic motion, rigid body dynamics, kepler's laws, pressure in fluids, intermolecular forces, Hooke's law, Young's modulus, fluid flow streamline turbulence, stroke's law, surface tension.

PHY112 - Heat, Sound and Optics (2 Units)
Temperature, thermometers, heat transfer, PVT –surfaces, Kinetic theory, first and second laws of thermodynamic, transverse and longitudinal waves, standing waves, intensity, beats. Doppler Effect, Electromagnetic spectrum. Huygen's principle, images formed by a single surface thin lenses, aberrations, the eye, optical instruments, interface, single slit, diffraction grating, polarization, elementary examples.

PHY119 - Physics Practical IA (1 Unit)
Simple experiments illustrating the topics covered in PHY 111 and PHY 112.
A selection from the following experiments use of measuring instruments, viscosity, surface tension oscillations about an equilibrium position, Hooke's law, moment of inertia, focal lengths of lenses, refractive index, optical instruments, the sonometer heat capacity, volume expansion and latent heat.

CHM111 - General Physical Chemistry (3 Units)
Historical development of the atom: atoms, Dalton's atomic theory, atomic masses. Fundamental particles of the atom atomic structure. Modern electronic theory of atoms. Periodicity of the elements. Stoichiometry mole concept, chemical formulas, equations and

calculations. State of mater; gas, liquid and solid. Chemical energetics and thermo chemistry. Chemical kinetics, equilibria and electrochemistry.

CHM119 - General Chemistry Practical 1 (1 Unit)

Practice in weighing and measurement of volume, preparations of standard solutions. Titrimetry: acid-base, oxidation-reduction, precipitation and complex metric titrations; gravimetric analysis.

Omega Semester

PHY121 - Electricity and Magnetism I (2 Units)

Coulomb's law, ohm's law, Gauss' Law, capacitors, Ohm's law, Kirchoff's laws, Electrical energy, DC bridges, potentiometer, magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometers, multi-meters, DC and AC motors and generators, power in AC circuits, semiconductors, conductivity and mobility, rectification.

PHY122 - Atomic and Nuclear Physics (2 Units)

Theory of atomic structure., Thompson, Rutherford and Bohr's theories, the hydrogen atom, properties of the electron, e/m, CRO, Millikan's experiment, properties of the nucleus, natural radioactivity, wave particle duality of light, x-rays, photo electricity , thermionic emission, diode valve.

PHY129 - Physics Practicals IB (1 Unit)

A selection from the following experiments, potential difference and internal resistance of cells, uses of potentiometer circuit, the meter bridge, simple direct current measuring instruments, Planck's constant, radioactivity.

MAT121 - Mathematics V: Calculus (3 Units)

Functions of Real Variables: Graph, Limits and Concepts of Continuity. Techniques of Differentiation of Algebraic and Trigonometric Functions, Higher Order Derivates, Maxima and Minimal, Leibnitz Rule, Application of Differentiation. Integration as Inverse of Differentiation, Methods of Integration, Definite Integra. Application to Areas, Volumes,

Moment of Inertial. Approximate Integration: Trapezoidal and Simpson's Rule. Taylor's and Mclaurin's Theorems, partial Differentiation and Implicit Differentiation.

MAT122 - Mathematics VI: Vector Algebra (2 Units)

3-Dimensional Cartesian Coordinate Systems. Definition and Representation of Vectors, Algebra of Vectors, Multiplication of a Vector by a Scalar, Addition of Vectors, Scalar Products of two Vectors, Direction Cosines, Calculus of Vector Functions, Differentiation of Vector Function, Integration of Vector Function. Conic: Circles, Parabola, Ellipse and Hyperbola.

CHM121 - General Organic Chemistry (2 Units)

Introduction to and importance of organic chemistry. Qualitative analysis of organic compounds. Isolation and purification of organic compounds. Quantitative analysis of organic compounds. Determination of structure of organic compounds; empirical, molecular and structural formulas. Hybridization; of sp^3, sp^2, sp orbital in carbon. Homologous series and functional groups. Isomerism-structural and stereoisomerism. Aliphatic hydrocarbon chemistry: alkenes, alkynes-nomenclature (IUPAC), physical properties, preparation and chemical reactions with simple mechanism where applicable.

CHM122 - General Inorganic Chemistry (2 Units)

Chemical bonding and structure: ionic, covalent, coordinate covalent (dative), metallic, hydrogen bonding. General properties of compounds formed by the different types of bonding. Influence of bonding on size, shape and structure. Main Group Chemistry (Groups IA – VIIIA): trends in the properties of elements (structure, ionization energies, physical and chemical properties). Properties of selected types of compounds.

CHM129 - General Chemistry Practical II (1Unit)

Qualitative analysis for common captions and anions. Identification of organic functional groups: hydroxyl, carbonyl, carboxylic, amino groups, sugar, carbohydrate, protein, etc.

200 Level

Alpha Semester

GEC210 - Engineering Mathematics I (2 Units)

Functions, inverse trigonometric functions and principal values, hyperbolic & its inverse, graphs. Concepts of continuity and differentiability. Mean-value theorem. Taylor's series expansion. Integration by parts. Sequences: real numbers, monotone, convergence, limits. Infinite series: convergence tests, addition, multiplication. Power series, radius of convergence, integration, differentiation. Real and imaginary parts, the complex plane, terminology and notation. Complex algebra, DeMoivre's theorem, powers and roots of complex numbers. Euler formula. Elementary functions of a complex variable, polynomials, rational, exponential, trigonometric, hyperbolic, logarithmic, inverse trigonometric and inverse hyperbolic functions. Vectors in R^n space, addition and scalar multiplication, linear combination of vectors, idea of linear dependence and independence. Dot and cross products, triple products, lines and planes.

GEC211 - Introduction to Electrical Engineering 1 (2 Units)

Overview of electrical engineering: meaning and description; devices and systems. Brief introduction to electric power system components: generation, transmission, distribution and loading. Basic electric circuit analysis: circuit quantities (voltage, charge and current, power and energy); circuit elements(resistors, capacitors, inductors); basic laws and theorems (ohm's law, voltage divider and current divider rules, star-delta transformations, Kirchoff's laws); AC circuits (sinusoids, phasors and phasor diagrams for circuit elements and their combinations, impedance and admittance, frequency response of RLC circuits, and resonance); power analysis (instantaneous and average power, power triangle, and power factor). Introduction to electrical transformers and machines: fundamentals of magnetic circuits; transformers (principle of operation, ideal and real properties, types and applications); DC and AC machines (constructional features and principles of operation of dc and ac

generators and motors, and applications). Introduction to OP Amps: ideal OP Amp, inverting and non-inverting amplifiers, summing amplifiers, difference amplifiers, cascaded op amp circuits and applications. Introduction to computer and digital systems: digital building blocks (logic circuits, combinatorial and sequential circuits); fundamentals of computer systems and networks. Introductory communications and control systems: communication systems (description, components, types and examples);control systems (description, components, types, and examples).

GEC212 - Engineering Graphics (2 Units)

Lettering, linework, dimensioning, orthographic projection, sectioning, isometric and oblique pictorial views. Graphical calculus, Architectural Drawing, electrical and communication, and IT symbols and drawing.

GEC213 - Materials Science and Raw Materials Studies (2 Units)

Raw material deposit survey in Nigeria: quantity, location. Processing techniques, and existing processed products. Material characteristics, and composition. Material re-cycling. Physics of materials. Chemistry of materials.

GEC214 - Applied Mechanics (3 Units)

Forces, moments, couples. Equilibrium of simple structures. First and second moments of area; centroids. Kinematics of rigid bodies in plane motion. Applications of Newton's laws of motion. Kinetic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature. The stress circle, deflection, deflection of beams. Shear forces and bending moments, analytical and graphical methods for structures. Design and analysis of communication towers, standards, and regulations.

GEC215 - Applied Computer Programming I (2 Units)

Software development life cycle (SDLC). Definitions, SDLC models: Waterfall model, V – shaped model, Incremental model, Spiral model. Program design: Algorithms: Key features of algorithms and different ways of presenting algorithms. Flow charting of algorithm. Pseudocode:

Pseudocode statements for input, output, iteration, decision, and processing, Arithmetic, relational and logical operations on Pseudocode, use of sub – process in Pseudocode. Introduction to QBASIC programming: Symbols, keywords, identifiers, data types, operators, control structure, functions, procedures. Array: 1-D, and multi-dimensional arrays. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, random access files.

GEC216 - General Engineering Laboratory 1 (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to Electrical Engineering, Materials Science, Applied Mechanics, Applied Computer Programming I and Workshop Technology Courses.

GEC217 - Engineer-In-Society I (1 Unit)

Science, Technology and Development: Ethical concepts of development. Indicators of development, and the role of science and technology. The contribution of the Government to the process of development and the Nigerian experience in the process of economic development (Nigerian Five Year Development Plans, successes and setbacks). Limits of growth, appropriate technology and a new world of science and technology. Science, Technology and Society: The inter-relationship of social ethics and values, and science and technology. Societal needs and resources in the genesis and development of science and technology. Social problems, impact assessment, and control of science and technology. Responsibilities of engineers. Science, Technology and Environment: Disruption or enhancement of environmental quality through harmful or sound science and technology in relation to air, space, water, land, populations, agriculture, industry, wild life, human settlements, culture, education, etc. Ethics and Professionalism: Theistic and secular concepts of personal, social and professional ethics. Codes of conduct of engineers. Motivation, control, responsibility, rewards and accountability of engineers and development of an ethical engineering professionalism. Council of Engineers and Engineering Societies.

GEC218 - Workshop Technology (2 Units)

Introduction to engineering workshop practice covering mechanical, electrical, information engineering, civil, chemical, and petroleum engineering. Use of hand tools, and safety measures in these fields.

Omega Semester

GEC220 - Engineering Mathematics II (2 Units)

Partial Differentiation: Functions of several variables, continuity and partial derivatives. Total differentials, approximate calculations using differentials. Chain rule. Implicit differentiation. Series representation of functions, (Maclaurin's and Taylor's) Taylor's Theorem. Extremum problems, without and with constraints, Lagrange multipliers, global extremum. Ordinary Differential Equations: Definition, degree, order, linear, non-linear, solution. First order equations, separable variables, equations reducible to separable form, exact equations, integrating factors, linear equations. Linear differential equations with constant coefficients, homogeneous, non-homogeneous, complementary functions, particular integrals, D-operator method. General linear second-order differential equations (without using matrices). Power series solution, Legendre's differential equation.

GEC221 – Thermodynamics (2 Units)

Basic concepts, quantitative relations of zeroth, first, second and third laws of thermodynamics. Behaviour of pure substances and perfect gases. Ideal gas cycles.

GEC222 - Computer Aided Design and Manufacture (2 Units)

AutoCAD: principle and use of autocad. Electronic drafting and use of autocad in electrical, electronic, computer & communication engineering design. System's manual writing, component assembly instruction manual preparation. Oral Communication: Public speaking skills with effective use of visual aids and statistical and technical information. Principles of effective communication in interpersonal and mass communication

process. Effective reading skills-extracting main ideas and reading for specific information through speed reading. Written Communication: Principles of technical writing.

GEC223 - Fluid Mechanics (2 Units)

Properties of fluids. Fluid statics. Density, pressure, surface tension, viscosity, compressibility, etc. Basic conservation laws, friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamics similitude, principles of construction and operation of selected hydraulic machinery. Hydropower systems.

GEC224 - Strength of Materials (2 Units)

Forces, moments. Equilibrium of simple structures and machine parts. Kinematics of particles and rigid bodies. Newton's laws. Kinetic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature change. Stress circle. Deflection of beams. Shear forces and bending moments. Analytical and graphical methods for structures.

GEC225 - Applied Computer Programming II (2 Units)

Review of QBASIC and Introduction of Visual BASIC, Comparison of QBASIC and VBASIC. Creating applications. VBASIC Integrated Development Environment. Menu Design, Use of Procedures, Functions, Subroutines, and Event Procedures. Opening and Saving Pictures to folders. Writing to and Reading from files e.g. Notepad, Ms Word. Writing to and Reading from Database e.g. Access. Writing to and Reading from Text and database over the NET, Printing. Multimedia with VB: Sound, Music, and Video, Animation with VB. Calling other Applications from VB (Shell execute), html, pdf, .doc, files.

GEC226 - General Engineering Laboratory II (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to electrical Engineering, Materials science, Applied Mechanics, Applied computer Programming I, and Workshop Technology courses.

GEC227 - Electrical Measurements and Instrumentations (2 Units)
Instrument systems including transducers, signal conditioners, and read out devices. Oscilloscope, recorders, bridges. Measurement of voltage, current, resistance, impedance, frequency, phase difference, electric power, energy, force, displacement, temperature, flow, pressure, and other engineering parameters.

GEC228 - Introduction to Electrical Engineering II (2 Units)
Analysis of Magnetic circuits, Hysteresis and eddy currents, three phase circuits, three-phase power measurement, Transformer theory; short-circuit and open-circuit tests, voltage regulation, efficiency. Electrical machines; constructional features and operation of dc generators and motors; single-phase and 3-phase motors and generators, electric energy utilization for lighting and heating. Tariffs.

GEC229 - Student Work Experience Programme (SWEP) (0 Unit)
Introduction to practices and skills through supervised hands-on workshop exercises in computer engineering and information & communication technology, and related general engineering. These exercises include familiarisation with basic tools, soldering and desoldering skill of pass-through & surface mount components, building of simple electronic circuits, troubleshooting of electronic devices, digital systems, etc. Use of hand drill. Safety precautions in handling electronics devices. Basic welding skill

300 Level

Alpha Semester

GEC310 - Engineering Mathematics III (3 Units)
Matrices and Determinants: Matrices, some special matrices, matrix operations. Determinants and some useful theorems. Laplace's development. Solution of system of linear equations by determinants. Linear dependence and independence, rank of a matrix. General system of linear equations, existence and properties of solution, Gaussian

elimination. Matrix inverse by elementary matrices, adjoint, and partitioning methods. Characteristic polynomial, characteristic equation, eigenvalues and eigenvectors. Diagonalization of matrices, application to system of first order linear differential equations. Multiple Integrals:Iterated integrals, multiple integrals over elementary regions. Change of variables, Jacobians. Differentiation of integrals involving a parameter, Leibniz's rule. Vector Algebra: Vector field, gradient and directional derivative, divergence, curl. Line and surface integrals, Stoke's theorem. Volume integrals, divergence theorem. Orthogonal transformations, scale factors, basis vectors. Cylindrical and spherical polar coordinate systems, gradient, divergence and curl in these systems. Fourier Series: periodic functions, trigonometric series. Fourier coefficients, Parsevals theorem, Functions of arbitrary period, even and odd functions. Half range expansion. Complex form of Fourier series. Integral Transform: Derivation of transforms and inverses (Fourier and Laplace). Applications of these transforms in boundary and initial value problems. Z transforms. Partial Differential Equations: Elementary properties of Gamma, Beta, Error, Bessel functions and Legendre polynomials. Basic concepts of partial differential equations. Classification of 2nd order linear partial differential equation into basic types. The principle of superposition. The wave, diffusion and Poisson's equations. Boundary and initial-value problems. D'Alembert's solution for wave equation. Method of separation of variables. Biharmonic equation.

EIE311 - Electromagnetic Fields and Waves (3 Units)

Review of Vector Algebra & Calculus: Scalar product and vector product, coordinate systems, gradient, curl, divergence operations. Gauss's, Stokes, Hemholtz and Green's integral theorems, integral of scalar and vector fields. Electrostatics: Charge and charge density. Coulomb's Law. Concept of fields. Electric flux density and electric field intensity. Gauss's Theorem and applications. Voltage and electric potential. Conductor, dielectrics. Polarization, susceptibility, permittivity. Electrostatic boundary condition. Capacitance calculation and electric energy. Magnestostatics: Current and current density. Magnetic dipoles and current loops. Magnetic flux density and magnetic field intensity. Biot-Savart Law and

Ampere's Law, Faraday's Law. Magnetostatic boundary condition. Self and mutual induction. Inductance calculation and magnetic energy. Maxwell's Equations: Time Varying fields : Faraday's Law of Induction, the conservation of charge and the incompleteness of Ampere's Law. Maxwell's equations and Lorentz force law. Uniform plane waves and wave equation. Time harmonic fields. Polarization of waves. Poynting's Theorem and the conservation of energy, the field definitions of impedance, admittance. Phase and group velocities. Waves in media: lossy media, dispersive media. Wave Propagation and Transmission Theory: Boundary conditions. Reflection and refraction at plane interface (normal and oblique angles), transmission line analogy. Transmission line theory: differential equations for a general transmission line, low loss and lossless lines, impedance characteristics of lines with various terminations, simple mismatch problems and the use of Smith Chart. Introduction to Waveguides and Cavity Resonators.

EIE312 - Communication Principles (3 Units)

Principles of Communications: An elementary account of the types of transmission. Brief historical development on communications: telegraph, telephony, radio, satellite, data, optical and mobile communications, facsimile. Block diagram of a communication system. The frequency spectrum. Signals and vectors, orthogonal functions, Fourier series, Fourier integral, signal spectrum, convolution, power and energy, correlation. Reasons for modulation. Types of modulation. Amplitude modulation systems: Comparison of AM systems, Methods of generating, and detecting AM, DBS, SSB signals. Vestigial sideband. Frequency mixing and multiplying, frequency division multiplexing, applications of AM systems. Frequency modulation systems: Instantaneous frequency, frequency deviation, modulation index, Bessel coefficients, significant sideband criteria, bandwidth of a sinusoidally modulated FM signal, power of an FM signal, narrowband FM, direct and indirect FM generation, various methods of FM demodulation, discriminator, phase-lock loop; limiter, pre-emphasis and de-emphasis, stereophonic FM broadcasting. Noise waveforms and characteristics. Thermal noise, shot noise, noise figure and noise temperature. Cascade network, experimental determination of noise figure. Effect of noise on AM and FM systems. Block diagram of a superheterodyne AM radio receiver, AM broadcast band and specification, signal sensitivity, aerial circuit, i.f. trap, RF amplifier design, frequency mixer, local oscillator design, inter modulation interference, adjacent channel interference, ganging, tracking error, intermediate frequency, automatic gain control, delay agc, diode detector, volume control. FM broadcast band specification, block diagram of a FM radio receiver, limiter and ratio detector, automatic frequency control, squelch circuit, FM mono and FM stereo receivers. AM broadcast band and specification. FM broadcast band and specification. Image frequency. FM mono and FM stereo receivers. TV broadcast band and specification. Signal format, transmitter and receiver block diagrams of Black and White TV, and Color TV.

EIE313 – Physical Electronics (2 Units)

Free electron motion in static electric and magnetic fields, electronic structure of matter, conductivity in crystalline solids, theory of energy bands in insulators, semi-ion-conductors and conductors: electrons in metals and electron emissions, carriers and transport phenomena in semi conductors, characteristics of resistors, diodes, transistors, photocells and light emitting diodes. Elementary discrete devices fabrication techniques and IC technology.

EIE314 - Electric Circuit Theory I (3 Units)

Electric fields: Fundamental concepts, energy storage. Magnetic fields: Fundamental laws, field calculations, and energy storage. Magnetic circuits: simple calculation of magnetic circuits, B – H curves and core losses. Inductance: Self and mutual inductance, coupled circuits. Transient and steady state response of circuits: RL, RC, RLC circuits, free and forced oscillation. Network analysis: network theorems; mesh and node analysis. One and two – port network: driving point functions, circuit parameters, interconnection and termination, transformation.

EIE315 - Electrical Machines I (3 Units)

Electromechanical energy conversion: Law of conservation of energy. General energy balance equation. Singly excited system (induced voltage, electrical energy and torque equations). Double excited system (electrical energy, induced voltage and torque equations)DC Machines: principles of operation construction simple armature windings-lap and wave. Emf equations. Commutation. Armature reaction DC Generators: methods of excitation (separate series, shunt and compound) conditions for self excitation of shunt generators. Parallel operation of d.c. generators. Characteristics of d.c. generators. D.C. Motors: methods of excitation (separate series, shunt and compound characteristics of D.C motors. Derive expression for torque developed in D.C motors. D.C motor starters speed control (varying the armature voltage varying the field magnetic flux, ward Leonard method) variable and constant losses in D.C. machines. Determining efficiency of D.C machines by Direct loading method, swinburnes method, Hopkins test. Conditions for maximum efficiency of D.C machines. Transformers: construction of single phase transformers. Principle of operation. Drawing phase diagrams for transformers on no-load and on load, "An Ideal transformer, deriving an expression for the turn ratio of a transformer. Emf equations of transformers, approximate equivalent circuit, efficiency voltage regulation. Three phase transformers: Construction grouping and connection of windings parallel operation. Conditions for parallel operation , testing of transformers, list different types of transformers – power, distribution autotransformers, current and voltage transformers. Methods of cooling tap changing. Tests on transformers.

EIE318 - Laboratory Course I (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from courses taught in this semesters. Report on each experiment is to be submitted immediately after the laboratory period for grading.

Omega Semester

GEC320 - Numerical Methods (2 Units)

Numerical Methods: Finite difference. Interpolation. Numerical differentiation and integration. Numerical solution of ordinary differential equations, Trapezoidal, Simpson, Runge Kutta methods. Newton Raphson method for roots of equations. System of simultaneous linear equations. Linear simultaneous equations, Gaussian elimination, Gauss-Seidel iterative method, Jacobi Method, evaluation of determinant and inverse matrix. Eigensystem analysis: system stability, eigenvalue sensitivity, stability of Gauss-Seidel solution, amplitude and time scaling for model studies. Use of numerical analysis software packages to solve simple engineering problems.

GEC321 – Engineer-in-Society II (1 Unit)

Introduction to engineering economy and law for engineers.

GEC324 - Technical Communications (1 Unit)

Introduction to Communications: Principles of effective communication in interpersonal and mass communication process. Verbal, graphical and numerical communications. Written Communication: Principles of technical writing. Types of technical writing, referencing and citation. Styles of writing. Graphs; diagrams presentation. Statistical information presentation. Macro level, and micro-level. Oral Communication: Public speaking skills, multi-media presentation skills. Facilitator and participant skills in meetings. Negotiating skills. Idea-generating skills. Manuscript speaking and presentation involving media and telecommunications. Reading skills: Effective reading skills: extracting main ideas and speed-reading, chunk/cluster-reading and word-attack techniques of technical reading materials. Equipment Manual Writing and Presentation: Component diagrams, assembling, description, and multi-language presentation. Basic troubleshooting information, and technical support information. Marketing strategy.

EIE321 - Introduction to Power Systems (2 Units)

Overview of power system. Single-phase and three-phase power calculations. Simple models of generators and transformers. Calculation of inductances of single-phase and three-phase lines. GMR and GMD. Bundled conductors. Calculation of capacitance of single-phase and three-phase lines. Current and voltage relations: Short, medium and long lines. Network equations and calculations: Power system components and equipment: Transformers, fuse cut outs, lightning arresters, voltage regulators, capacitors, switches, circuit breakers, reclosers, insulators, etc. Tariff and power factor improvements.

EIE322 - Signals and Systems (2 Units)

Continuous and discrete signals: transformations and inverse transformations, spectral analysis of steps, ramps and impulse, signal description by impulse and step functions. The independent variables: definition of rise time, settling time, overshoot, period magnitude and duration of a signal. Fourier analysis: periodic and non-periodic signals; Perseval theorem. Devices and models: network analysis and circuit with independent and dependent sources. Time invariant and stationary systems.

EIE323 - Analogue Electronics (3 Units)

Review of single stage transistor amplifiers using BJTs and FETs. Equivalent circuit and calculation of current gain, voltage gain, power gain, input and output impedance. Operational Amplifiers: Parameters and applications, Feedback, Broadband and narrow band amplifiers. Power amplifiers, voltage and current stabilizing circuits, voltage amplifiers, multi-0stage amplifiers using BJT and FETs.

EIE324 – Electric Circuit Theory II (3 Units)

Laplace transform methods in circuits analysis, transfer functions, pole – zero analysis, graphical representation. Basic state variable approach. Filter: rectifier filter. LC filters, K - & M – derived filters, frequency response. Network graphs and topology: basic concepts, application to non – planar networks. Waveforms and harmonics: Fourier analysis,

approximate harmonic analysis, circuits with non – sinusoidal excitation. Symmetrical components: Basic concepts and simple application.

EIE325 - Use of Engineering Packages (1 Unit)

Practical hands-on proficiency in the use of engineering packages for analysis, design, and simulation such as MATLAB, PSPICE, etc. It is a computer laboratory course.

EIE326 - Software Development Techniques (2 Units)

Engineering practices for the development of non-trivial software-intensive systems including requirement specification, Software architecture, implementation, verification and maintenance. Iterative development. Recognized standards, guidelines and models. Flowchart ANSI symbols and usage. Extensive examples, and exercises using pseudo-code/flowchart to solve practical problems in engineering. Debugging and documentation techniques. Programming using a structured language such as C: Symbols, keywords, identifiers, data types, operators, various statements, operator precedence, type conversion, conditional and control structures, function, recursive functions. Arrays: 1-D, and multi-dimensional arrays, passing elements or whole array to a function. Simple sorting and searching on arrays, pointers, strings, dynamic memory allocation. Structures and Unions: Structure declaration and definition, accessing structures, array of structures, pointers and structures, union declaration, enumerated variables. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, random access files. Advanced Topics: Command line parameters, pointers to functions, creation of header files, stacks, linked lists ,bitwise manipulation. Software development in C in MS Windows , UNIX/LINUX environments, header file, preprocessor directives, make, Makefile. Static and dynamic linking libraries. Extensive examples, and exercises programming in C to solve practical problems in engineering. Exercises are to be done in the Computer Laboratory.

EIE327 - Digital Electronics (3 Units)

Number Systems and Code. Logic Gates. Simplification of Logic Expressions using Boolean algebra. Simplification of Logic expressions using Karnaugh Maps. Combinational Logic Circuit Design Analysis and Synthesis. Algorithms for deriving minimal SOP forms from K-maps. POS form using K-maps. Algorithms for deriving minimal POS forms from K-maps. Computer-aided minimization of switching functions. Digital vs. analog systems. Mixed signal design, analogue and digital grounding. Digital system design hierarchy. Logic devices : TTL and CMOS families, technology, applications, signal levels, mixing, and interfacing. Interference and noise. Memory devices. Latches, Flip-flops. Sequential Logic Design: Counters, Registers. Timing circuits. Modular Design. Decoders. Decoder Circuit Structures. Implementing Logic Functions Using Decoder. Encoder Circuit Structures. Multiplexers/Data. Selectors. Multiplexer Circuit Structures. Applications of Multiplexers. Demultiplexers/Data Distributors. Arithmetic Circuits: Half Adder/Subtractors Full Adders/Subtractors. Comparators. Arithmetic Overflow Detection. Design Example: A Computer Arithmetic Logic Unit. Computer-aided Design of Modular Systems.

EIE328 - Laboratory Course II (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from courses taught in this semesters. Report on each experiment is to be submitted immediately after the laboratory period for grading.

400 Level

Alpha Semester

GEC410 - Probability and Statistics (2 Units)

Probability and Statistics: Probability space, theorems. Conditional probability and independence. random variables, discrete and continuous distributions, mean and variance. Bernouli, Binomial, Poisson,

hypergeometric, exponential, normal distributions and their characteristics. Examples of experimental measurement and reliability. Elementary sampling theory for normal population. Central limit theorem. Statistical inference (point and interval estimation and hypothesis testing) on means, proportions and variances. Power and operating characteristics of tests. Chi-squares test of goodness of fit. Simple linear regressions.

EIE411 - Computer Organization and Architecture (3 Units)

Computer Fundamentals: Development history of computer hardware and software. Hardwired vs stored program concept. Von-Neuman architecture. Havard architecture: principle of operation, advantages, disadvantages. Single address machine. Contemporary computers. Computer system: block diagram, functions, examples, dataflow, control line. Computer Arithmetic: integer arithmetic (addition, subtraction, multiplication, division), floating-point representation (IEEE), floating-point arithmetic. arithmetic and logic unit (ALU). Introduction to CISC and RISC architecture: principle of operation, merits, demerits. Storage and Input/Output Systems: Computer function (fetch and execute cycles), interrupts, interconnection structures (Bus structure and bus types), Overview of memory system, memory chip organization and error correction, cache memory, memory storage devices. Overview of I/O, programmed and interrupt-driven I/Os, DMA, I/O channel and I/O processor. Control Unit: Micro-operations, control of the CPU, hardwired implementation, control unit operation, micro-instruction sequencing and execution, micro-programmed control. Use INTEL family, and MOTOROLA family as case study of a CISC computer system. Instruction Set and Register: Machine instruction characteristics, types of operands and operations, instruction functions, addressing modes, instruction formats, register organization, instruction pipelining. High performance computer systems: Techniques to achieve high performance, pipelining, storage hierarchy, units with function dedicated for I/O. RISC, introduction to superscalar processor, parallel processor. Use popular RISC processor (e.g. i960, Motorola PowerPC) as case study.

Operating System:
Overview of operating system, dimension and type of operating system, high level scheduling, short-term scheduling, I/O scheduling, memory management, virtual memory, UNIX/LINUX operating system: architecture, commands, programming; window based operating systems (MS windows, X-window).

EIE412 - Control Systems (3 Units)

Introduction: definition, examples of control systems. Open-loop and closed-loop control systems. Review of Laplace and inverse Laplace transforms. System modelling: Signal flow graph, block diagram. Transfer function. Poles and zeros. Block diagram reduction using signal flow graph and block diagram reduction techniques. Mechanical, electrical and electromechanical systems. First and second order models, higher order models. Definitions of transient response parameters. Analysis of second-order system as prototype. Routh-Hurwitz stability criterion. Classification of systems based on steady-state characteristics, steady-state error coefficient. Definition of Root locus, Properties of root locus, sketching of root locus plots. Effect of open-loop zeros and poles. Root locus design concepts. Frequency response analysis and design: Bode diagram, Polar plot, Nichols plot. Nyquist stability criterion: non-mathematical description of Nyquist criterion, interpretation of stability. Relative stability - Gain and phase margins. Closed-loop frequency response analysis - M and N contours, Nichols chart. Compensation techniques: lag, lead and lag-lead compensation, PD, PI and PID controllers. Cascade compensation based on root-locus method. Introduction to Feedback compensation. Computer-aided design and analysis of control system.

EIE413 - Laboratory Course and Mini Project (1 Unit)

Laboratory investigations and group mini-projects in computer, Electrical & Electronics, and Information & Communication Engineering. The write-up report on the project is to be submitted for grading and defence by each group.

EIE414 - Design and Installation of Electrical and ICT Services (2 Units)

Electrical Installation: Introduction to Health and Safety at Work Act in Nigeria. Electrical safety. First aid. Electricity supply regulations. Lighting and Illumination: Luminous intensity and flux. Maintenance factor. Coefficient of utilization. Types of light sources. Calculation of lighting requirements. Glare. Stroboscopic effect. Installation Materials, cables, junction box, terminations, joints. Conduits and ducting. Truck and truncking. Electrical Installation design in domestic, commercial, and industry. Alarm and emergency systems. Earthing and Protection. Purposes of earthing. Faraday cage. Rod electrodes. Earth electrode resistance. Earthing system. Earth fault loop impedance. ICT services: NCC and FCC codes of practice and standards. Telecommunication design and installation: Satellite, VSAT, etc. Telephone design and installation. Computer networking design and installation. Wireless LAN design and installation. Preparation of Bill of Engineering Measurement Evaluation. Contract bidding. Consultancy.

ICE414 - Internet Technology and Programming (3 Units)

Internet definition, Internet services- E-mail, FTP, WWW, Telnet. The Internet Architecture, organization, Protocol- IPv4, IPv6, addressing, and routing. Routing protocols: Interior, and exterior routing protocols, IP Multicast Routing, The intra domain routing protocols DVMRP, multicast OSPF, PIM dense and PIM sparse, and of the inter-domain routing protocols MSDP, BGMP and CBT. Mobile-IP standards. The Integrated Service architecture of RSVP, and of the Differentiated Service extensions to IP, New IP, Implementation Issues of Internet Protocols. Web Authoring: Introduction to Hypertext Markup Language, HTML Standards, HTML Extensions, Types of Web pages, Webpage Basics: HTML Tags, Text and Information, Links, Lists, Tables, Multimedia: Graphics, Audio, Video, Enhanced Features: Image Maps, Counters, User Interaction: Forms, CGI, PERL, Java, Design Considerations, Dynamic Web pages, Active Server Page, XML, WML, WAP-enabled databases, Webpage Design Tools. Internet Service Providers, Types of Internet Connections, Intranets & Extranets, Browsers: Netscape

Communicator, Internet Explorer, Browser Plug-Ins, Helper Applications, Web Authoring Tools, Internet Hardware Requirements. Designing and Managing Websites, Connecting to the Web Provider, Publishing Web pages, Website Maintenance Tools, Factors Affecting Website Performance, Interfacing with Other Information Servers, Internet and WWW Standardisation Activities, Guidelines for the Evaluation of New Technologies, Strategies for Integrating New Technologies in a Web Environment. On-line Applications: Simple Applications, Counters, On-line Quiz and Evaluation, On-line Databases, Monitoring User Events, Plug-ins, Database Connectivity. Web Applications: Transactions through the Web, Web Portals: Internet Marketing Basics; Developing and Integrating Internet Communication Strategy; Creative Strategies, Business Models, Online Databases, VRML, Security and Legal Considerations, Future Trends.

ICE416 - Random Processes and Queue Theory (3 Units)

Review of probability: Basic concepts. Conditional and total probability. Distribution and density functions. Random variables: single and multiple variables. Mean variance and moments. Basic concepts , definition, and classification of random processes. Stationary process and independence property. Autocorrelation and correlation functions. Ergodicity. Power density spectrum. Linear systems. Hilbert Transforms. Noise modelling. Linear system response to random signal. Narrowband, bandlimited and bandpass processes. Optimal linear systems: matched filter for white noise and coloured noise, Wiener filters, minimum mean-squared error. Optimization by parameter selection.Poisson points and renewals. Queueing theory. Shot noise. Markov processes. Applications of random signal theory in communications: AM system and noise performance, FM system and noise performance, noise in a phase-locked loop, radar detection: false alarm probability and threshold detection probability.

EIE418 - Data Communications and Computer Networks (3 Units)

Interfacing: Interfaces for simple computer system and terminal to terminal. MODEM, terminal interfaces, CCITT V.24/RS-232, CCITT V.28, V.35, GPIB, EIA, RS-232C standard, speed and distance limitations for V.24, RS-232C, RS-449/422/423 interfaces and standards. Channel Coding and Error Control: Forward Error Control; Error Detection Methods; Parity Checking; Linear Block Codes, Cyclic Redundancy Checking; Feedback Error Control. Digitalisation: Sampling theorem, Shannon theorem, PCM and Quantisation Error; Multiplexing, FDM, TDM; Higher order multiplexing; Frame formatting, time-slot. Digital Modulation Techniques: Line coding, intersymbol interference, Nyquist wave shaping, eye pattern, adaptive equalization. Transmission over bandpass channel. ASK, FSK, PSK, DPSK, M-ary modulation, continuous phase FSK, MSK, QAM, DSL Schemes. Spread Spectrum Communications: Pseudo noise sequences, direct sequence spread spectrum, frequency hopping spread spectrum, CDMA, application examples. Telephony: The telephone set and subscriber loop interface, basic function of the telephone set, cordless telephone, local loop, line characteristics and conditioning. Public switched telephone network, hybrids, echo suppression. Central office switching system. Digital Switching: Digital Switching Systems, Space Switching, Time Switching Module; Time-Space-Time Switch Structure, Circuit switching networks; Packet switching networks; X.25 packet switched networks, ISDN interfaces and functions: Transmission structure, user-network interface configurations, ISDN protocol architecture, connections, addressing. Physical layer. Data link layer, network layer. Frame Relay: Background. Protocols and service. Frame-mode protocol architecture, frame-mode call control, Frame relay congestion control: Traffic rate management, explicit congestion avoidance and implicit congestion control. ATM: Virtual channels and virtual path. ATM protocols, transmission of ATM cells, ATM adaptation layer. AAL services. Traffic and congestion control. Latency/speed effect, cell delay variation. Network resource management, connection admission control, usage parameter control, priority control. Cellular Mobile Network: 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. Call Processing and Signalling: Roaming and mobility management; Traffic engineering and performance issues, call set up and hand-offs; Capacity planning; Factors affecting economical network designs.

Omega Semester

GEC429 - Students Industrial Work Experience (SIWES) (6 Units)

During the SIWES, each student will undergo a practical on the job training in engineering industry approved for its relevance to the student's major for a minimum of 28 weeks starting immediately after the first semester examinations at 400 level. A programme of training will be drawn by the College and the Industry for each student, and a prescribed log book with daily recording of the student activities is to be kept by each student and appropriately signed. At the end of the programme, a written report is to be submitted to the college and each student to present a seminar on his/her industrial experience. Each student must pass a prescribed certification examination during the industrial training.

500 Level

Alpha Semester

EIE510 - Research Methodology (1 Unit)

Definition of Research, Charateristics of Research, Types of Reseacrh, The Reseacrh Process,Formulating the Reseacrh Problem,Considerations in Selecting a Reseacrh Problem, Reviewing the Literature, Procedure for reviewing the Literature, The Formulation of Objectives, Preparing the Reseacrh Design, Consideration for the Research Design,Guidelines to construct a Research tool,Constructing a Questionnaire, Piloting the Questionnaire,Collecting Data, Ethical Issues concerning reseacrh participants, Ethical Issues relating to the researcher,Processing and Analyzing Data, The Data Processing Operations, Data Analyzing methods,Generalization and interpreation of the Results, Reporting the Findings, Written Research Project Report Format,General Attributes of a Reseacrh Proposal, What distinguishes an Engineering Reseacrh Proposal, Components of a Reseach Proposal,Costing an Engineering Reseacrh Proposal.

EIE511 - Project Management (2 Units)

Management Concepts. Project organization, teams, methods and tools for project management. Organization 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. Quality measurement.

EIE512 - Systems Reliability and Maintainability (2 Units)

Introduction to reliability, maintainability, reliability specification and metrics. Application to computer hardware system, communication equipment, power systems, electronic components. Basic maintenance types, and procedures for computers and digital communication systems. Fault troubleshooting techniques. QoS and time of availability of data communications. Quality control techniques. Design for higher Metrics, fault avoidance, fault tolerance, programming for reliability, software safety and hazard analysis. Comparison of hardware and software reliability. Software Quality and Assurance: definition of software quality, software quality factors, quality control, cost of quality , quality assurance. SQA activities, formal technical reviews, software quality metrics, statistical quality assurance. ISO 9000 Requirements and certification, ISO 9000-3 for software quality process, process documentation, quality audit. Capability Maturity Model: Software Engineering Institute, levels of maturity, key process areas, Comparison between ISO 9000 Standards and CMM. Ensuring Quality and Reliability: verification and validation, measurement tracking and feedback mechanism, total quality management, risk management.

EIE513 - Cyberpreneurship and Cyber Law (2 Units)

Introduction: Definition of creativity, innovation, examples of creativity leading to innovation, commercialization of creative and innovative ideas. Trends in technology development. Entrepreneurship management and ownership. Characteristics of entrepreneur, starting a new business, business planning, strategic planning and management, site selection and layout. Establishing new venture, risk management. Business Plan Development: definition, need, preparation of business plan. Forecasting developments and charting an action plan. Identifying the product/service, market research and feasibility study. Financing business. Sources of debt financing. Creating the marketing plan, pricing, creative advertising and promotion. Entrepreneurship case studies: Overview and analysis of successful entrepreneurs such as Bill Gates, Michael Dell, David Filo and Jerry Yang of Yahoo, etc. Nigerian entrepreneurship. Discussion of Nigerian business environment, and illustrated with successful Nigerian entrepreneurs. Overview of the Nigerian Legal System: Civil and criminal. Basic concepts of law. Contract Law. Current issues: digital signatures, intellectual property and copyright. Speech Law: Defamation, Sedition, Printing Press Act. Speech on the Internet. Advertising Code: Made in Nigeria rules and guidelines, Advertising standards. Media and Licensing law in Nigerian: Developing an in-depth understanding of the nature and function of Nigerian cyber law. Public and private licensing. Intellectual and moral rights. Music royalties, synchronization rights, performance rights. Role of music publishers. Broadcast rights, merchandising. Detailed analysis of Communications and Multimedia Act. Ethic and Etiquette: New codes of social behaviour: the right to privacy.

ICE510 - Satellite Communications (3 Units)

Brief history and overview of Satellite Communications. Orbital Mechanics. Satellite Subsystems. Satellite Link Design. Modulation & Multiplexing Techniques used in Satcom. Multiple Access Techniques. Error Correction for Digital Satellite Links. Propagation Effects and their Impact on Satellite Links. VSAT Systems. LEOs and Non-Geostationary

Satellite Systems. DBS TV and Radio. Satellite Navigation and the Global Positioning System.

ICE511 - Mobile Communication and Network (2 Units)

Evolution of mobile radio communications. Examples of mobile radio systems: radio paging, cordless telephones, cellular radio. Trends in cellular radio and personal communications. A basic cellular system, Frequency reuse, Roaming, Hand-off strategies, Co-channel interference, Traffic and Grade of service, System capacity, Improving capacity of cellular system. Propagation path loss, multipath propagation problem, Raleigh fading, Rician distribution. Doppler effect. Field strength prediction models, co-channel interference and reduction, adjacent channel interference, near-far problem. Standards and overview of analogue and digital cellular systems: AMPS, TACS, GSM, CT2, PCN, DECT, PHS. Frequency management and channel assignment, speech coding, channel coding, bandwidth consideration, equalization, modulation techniques, multiple access techniques. GSM: Architecture, elements, and standard interfaces; FDMA/TDMA structure; Speech and channel coding ; time slots and bursts; signaling; hand-offs; DCS 1800; GPRS; data services over gsm. Third Generation Wireless Standard: convergence; UMTS; IMT-2000; CDMA2000; W-CDMA; UWC-136; Network layer standards. Paging services and technologies; Short Message Services. Call Processing: Signaling; Roaming and mobility management; Route optimization; Wireless Intelligent Networking; Databases; Protocols; Security and billing issues. Global Positioning System: principles, and applications.

ICE512 - Antennas and Propagation (3 Units)

Antenna Systems: Review of Maxwell's equations. Polarization, polar diagrams, antenna gain, directivity, radiation resistance, impedance matching, effective length and capture area. Radiation by dynamic currents and charges, retarded potentials, the isotrope. Hetzian dipole, short and loop antenna, folded dipole antenna. Vertical and horizontal antennas, rhombic antenna, log-periodic antenna. Centre-fed linear antenna, linear arrays, radiation from diffraction gratings, Yagi-Uda arrays, integrated antennas. Microwave antenna, horn, parabolic reflectors, slot, lenses. Field analysis of antennas. Transmitting-receiving system, reciprocity relations. Equivalent circuit of receiving antenna. Radar Systems: Principles of pulse radar and Doppler radar. Radar equation and system parameters. Components of radar systems. Study of a practical radar system. Radar signal detection. Synthetic aperture radar, tracking and scanning radar, HF (OTR) radar. Radio Wave Propagation: Electromagnetic waves, wave front, characteristic impedance of free space, reflection, refraction and diffraction. Ground waves and sky waves. The ionospheric layers, refractive index, virtual height, critical frequency and angle, maximum usable frequency, skip zone, skip distance, fading. VHF line of sight transmission. Tropospheric scattering communications. Relationship between transmitter power, antenna gains and received signal to noise in a free space radio link. VHF and microwave point-to-point link.

EIE515 - Digital Signal Processing (3 Units)

Introduction: Advantages of digital over analogue signal processing, problems of digitization, overview of application of DSP, basic elements of DSP system. Digital Processing of analogue signals: Sampling of analogue signals, sampling theorem, aliasing, quantization, noise, and coding, types and selection of ADC/DAC, Sigma-delta ADC. Analytical tools: z-transform, properties, transfer function, inverse z-transform, z-plane poles and zeros, analysis of linear time-invariant in z-domain, system stability. Discrete Fourier Analysis: Discrete Fourier Transform and properties, inverse DFT, truncated Fourier transform, windowing, FFT algorithms. Discrete Time Signals & systems: Discrete time sequences (signals), classification and determination of discrete time system, discrete time i/o description (difference equation), solution of difference equations, convolution, correlation, impulse response. Digital Filters: Definition and types. FIR filters: Transfer function, characteristics, applications, design methods, Gibb's effect and elimination, fir filter realisation. IIR filter: Transfer function, characteristics, applications, overview of analogue filter design techniques, design methods-conversion from analogue to digital filter design techniques, IIR filter realization.

Structure of Discrete Time System: Block diagram representation of constant coefficient difference equations, IIR and FIR systems and their basic structures, stability of discrete time systems. Software implementation of dsp algorithms. DSP Microprocessors: Architecture, fixed point vs floating point DSP, Finite word length effects. DSP chips: interfacing and programming. Practical application of DSP in audio, and video.

EIE517 - Applied Electronics (2 Units)

Radio Frequency Amplifiers: Resonance, Circuit Q and Bandwidth, Small-Signal RF Amplifier Design, Coupling Tuned Circuits, Transformer Coupling, Double-Tuned Circuits, IF Amplifiers, Ceramic Filters, RF Power Amplifiers, Neutralization, Impedance Matching Networks. S-Parameter Theory and Applications: Properties of S Parameters, Power-Gain Equations, Amplifier Stability, Constant-Gain Circles, Constant Operating Power-Gain Circles, Constant-Noise-Figure Circles. Small-Signal and Narrowband Amplifiers: DC Biasing Circuits, High-Gain Amplifier, Low-Noise Amplifier. Balanced Amplifiers: Lange Couplers, Balanced Amplifier Design, Power-combining techniques. Large-Signal and Broadband Amplifiers: Large-Signal Amplifier, High-Power Amplifier, Low-Noise Amplifier, Broadband Amplifier, Feedback Techniques, Distributed Amplifier. Microwave Oscillators: Oscillation Conditions, Oscillator Circuit Configurations, Tuning Circuits, One-Port Oscillator, Two-Port Oscillator, High-Power Oscillator, Broadband Oscillator. Phase-Locked Loop: Principle of operation, phase detector, voltage controlled oscillator, capture and locked range, Loop Frequency Response, Transient response, applications of PLL: frequency synthesis, pulse transmission synchronization. Video Bandwidth and Resolution, Transmitted Video and Audio Signals.

EIE519 - Project I (0 Unit)

Each student is required to undertake a project that gives productivity value to the academic knowledge gained in his\her field of study. The project shall involve problem solving using engineering theories and techniques, and the implementation of the project design. The student is expected to design a possible solution to the problem, taking into account various aspects such as professionalism, economy, costing, and engineering viability. At the end of the first semester, each student shall present a seminar on his/her project.

Omega Semester

ICE520 - Broadcasting Engineering (2 Units)

Elements of broadcasting system. Studio: Design, acoustic, and equipment. Broadcasting regulations. Frequency spectrum: Allocation, assignment, and licencing, Regulatory bodies. Radio, Television, Cable TV and satellite channel bandwidth, designation. Design, configuration and services of CATV, MATV, MMDS systems. Multipath, polarization, radiated field strength, energy, and footprint. Transmitter power rating, beamwidth, co-channel interference and minimum separation. Frequency spectrum management techniques of digital and analogue radio, television, and satellite broadcasting. Antenna design and installation for radio, television, and satellite. Antenna support: Mast, Tower, High Altitude design and application.

ICE521 - Microwave Devices and Measurements (2 Units)

Introduction: Development history microwave devices, performance characteristics and applications of various classes of microwave devices, revision of band theory and semiconductors. Microwave Diodes: Principle, characteristics of p-i-n, schottky, varactor, and tunnel diodes, applications in microwave circuits. Microwave bipolar transistors: Principle, characteristics, and microwave applications of bipolar transistors and heterojunction bipolar transistors. Microwave field effect transistors: Principle , characteristics , microwave applications of JFET, MESFET, HEMT, MOSFET and CCD. Transferred electron devices. Avalanche Transit-Time Devices. Microwave Tubes: principle, characteristics of Klystrons, Travelling-Wave Tubes, and Magnetrons. Power measurements. Spectrum analysis: operation, Swept-tuned Spectrum Analyzer, Specifications, Measurement parameters: Modulation, Harmonic Distortion, IP3, Phase Noise, Filter response.

Impedance measurements, matching , and transformation. Transmission Line Equations and Solutions, Smith Chart, ABCD Matrix, S-Parameter Matrix, Signal Flow Graphs. Noise Figure measurements. Waveguide Components: Rectangular waveguide, bends and twists, ridge waveguide, fin line, terminations, attenuators, phase shifters, circular polarizers, directional couplers, hybrid junctions, ferrites, faraday rotation, isolators, circulators, cavity resonators, coaxial-to-waveguide transitions, rotary joints, switches. Coaxial Components: Two-wire line, coaxial cables, terminations, connectors and transitions, attenuators, phase shifters, baluns. Stripline Circuits: Substrate materials, stripline, coupled stripline, microstrip, coupled microstrip, coplanar stripline, terminations, attenuators, couplers, power dividers, circulators and isolators, resonators, lowpass filters, bandstop filters, bandpass filters, wideband filters.

ICE522 - Telecommunication Software Development (2 Units)

Introduction: From simple switching machines to intelligent systems, hardware and software evolution, system architecture examples of typical telecommunication system such as GSM system. Software development: Software engineering principle, software life cycle- V, Y, Spiral life cycle. Methods and tools for: requirement capture, analysis, specification, architecture, design and development. Design technique: Finite state machines: the SDL language. OO modeling: the UML language, design patterns, standardization trends. Programming: Overview of programming languages (C, C++, Java) in telecommunication. Real-time programming. Programming for embedded systems. Performance and memory management. Configuration management. Interfacing: Software and hardware integration. System tests.

ICE525 - Computer Security Techniques (2 Units)

Introduction: Overview of computer security, attacks and services, control of hardware software. Usage. Intruders, Viruses and Worms: Intrusion techniques. Nontechnical attacks. Password protection and its vulnerability. Intrusion detection. Nature of viruses. Malicious programs. Types of viruses. Antivirus approaches. Worm propagation and countermeasures: access control, intrusion detection and firewalls.

Disaster Recovery: Recovery requirements, policy, strategy, technical team. Execution of recovery plans. Documentation and backup system. Loss estimation. Developing Secure Computer System: External Security Measures, Issue, Security Models [Specification and Verification, Bell and LaPadulla Model, Clark-Wilson Model, Goguen-Meseguer, TCSEC], Discretionary Access Requirements, Mandatory Access Requirements, User Authentication, Access and Information Flow Control, Auditing and Intrusion Detection, Damage Control and Assessment, Microcomputer Security. Entropy, perfect secrecy, unicity distance, complexity theory, NP completeness, number theory. Cryptographic System, Public Key Systems, digital signatures. Network and Telecommunication Security: Fundamentals, Issue, Objective and Threats, Security Services, Distributed System Security, The Trusted Network Interpretation, TNI Security Services, AIS Interconnection Issues, Firewalls [Gateways, Application, Cost and Effectiveness] .Database Security: Security Requirements to Databases, Designing the Security, Methods of Protection, Security of Multilevel Database.

EIE520 - Artificial Neural Networks (2 Units)

Neural Network: Definition of artificial neural network. Similarities of neural network with 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 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. Engineering applications. ANN programming.

EIE528 - Digital Control Systems (2 Units)

Introduction: Advantages, and configuration. Concept of sampling: Nyquist sampling theorem, aliasing, multiple channel sampling, choice of ADC and DAC. Difference equation and solution. The z-transform: direct, transfer function, inverse transform methods, response of linear discrete system. Z-transform applications. Z-transform of sampling instants, zero-order-hold, Z and S plane relationship. Closed loop sampled data system, stability analysis. Finite word length effect. Digital PID algorithm and compensator design. Root locus of digital control system. Sequential control system design. State variable of dynamic system, solution of state equations, transition matrix, eigenvalues, eigenvector. SCADA system. CAD digital control system.

EEE529 - Introduction to Mechatronics (2 Units)

Definition and application of the synergy. Mechanical gear system, rack and pinion, worm and screw, and simple calculations. Electrical transformer as equivalent of mechanical gear. Analogue sensors: pressure, temperature, linear displacement, angular displacement, rate gyro, acceleration, light sensors, ir sensors, hall effect sensors. Motion detection. Digital sensors: heading sensor, gps, gsm, compass, digital infrared sensor, shaft encoder, and their interfacing. Actuators: DC motors, servo, stepper motor, ac motor, linear actuator, relays. Signal conditioning, introduction to adc and dac.

EIE529 - Project II (6 Units)

The project work is to be completed in this second phase. Each student is to submit a proper written report (binded 3 hardcopies, and a CD-ROM of electronic copy). The project is presented and defended at a seminar.

EIE521 - Electromagnetic Interferences (2 Units)

Concern for electromagnetic compatibility. Circuit theory approach and field theory approach. Comparative analysis. Coupling and Shielding: Capacitive (electric) coupling. Inductive (magnetic) coupling. Shielding of cables. Effects of shield resistance, cause and effects of leakage flux, stray current return paths, methods of adding common-mode impedance. Balanced circuits. Grounding: Grounding of multiple-chassis systems. Signal ground connections. Safety ground connections. Layout and grounding of printed circuit board: layout consideration, current return path, power distribution within a PCB. Radiation :Radiation coupling between distant devices. Superposition of multiple electric and magnetic sources. Cabinet shielding. Absorption losses and reflection losses for nonmagnetic shields. Effects of shield apertures: current flow in shields, slot antenna theory, waveguide theory. Shield penetration by wires and cables. Interconnecting leads as antennas, treatment of power, low frequency and high frequency leads. EMC Regulations and Measurements: Civilian regulations. Measurement of radiated emissions. Anechoic Chamber. Test site calibration. Measurement of conducted emissions.

EIE522 - JAVA Technology and Programming (2 Units)

Java Programming: Java basics, Java Applets and Applications, decisions and repetitions, arrays and strings, methods and parameters. Objects and classes, encapsulation and data hiding, data abstraction and abstract data types (ADTs), inheritance, polymorphism, abstract classes and design principles, java.awt and java.awt.event packages, buttons, labels, lists, text fields and panels, mouse events and keyboard events, scrollbars and layout managers. Basics of Java exception handling, try blocks, throwing an exception, tatching an exception, throws clause, constructors, finalisers and exception handling, exceptions and inheritance, finally block. Thread methods, thread states, thread priorities and thread scheduling, thread synchronization, daemon threads, runnable interface, thread groups. Multimedia Applications: Loading, Displaying and Scaling Images, Introduction to Animation, Graphics Double Buffering, Media Tracker, Loading and Playing audio Clips, Customizing Applets, Image Maps. Network programming: Introduction, Manipulating URLS, Establishing a Simple Server, Establishing a Simple Client, Client/Server Interactions, Security and the Network.

EIE523 - Multimedia Technology and Programming (2 Units)

Introduction: Multimedia state-of-the art, impact of multimedia, technology, and applications. Multimedia Components: Text, data, audio, image, video. Text: Text compression and decompression. Text coding and decoding. Multi-languages. Unicode. Data: Framing of data. Segmentation of data frames. Data formats, data encryption, data recovery, data representation and manipulation. Audio: Audio creation and encoding. Audio recording format, mono and stereo. Audio compression. Real-time audio. Audio streaming technique. Voice recognition. Image: Image formats, image color scheme, image enhancement, image processing techniques, image compression, scale of compression, multiple images, animation. Video: Video recording formats and standards, resolution, compression, video streaming techniques. Multimedia Systems: Integration, storing and presentation of multimedia. Comparison of analogue and digital recording. System integration and coordination. Real-time recording and transmission. Error recovery. Video conferencing systems: configuration, functions, transmission, technology. Multimedia over the networks: Hypertext: concepts. Hypertext Markup Language (HTML). HTML programming and multimedia document design. An introduction to XML. Uniform Resource Locators (URL). Protocols: HTTP, FTP, SMTP. Common Gateway Interface (CGI) processing. MIME specification. Script language. Platform independent language, bytecode and interpreter. Multimedia application over the Intranet and the Internet.

EIE524 - Cryptography Principles and Applications (2 Units)

History of cryptographic System, Public Key Systems, Digital Signatures. Information Theory: Entropy, Perfect Secrecy, Unicity Distance, Complexity Theory, NP Completeness, Number Theory. Data Encryption Methods : Transposition Ciphers, Substitution Ciphers, Product Ciphers, Exponentiation Ciphers, Knapsack Ciphers, Breakable NP-Complete Knapsack, Encryption Standards DES, RSA, 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, Ethical Issue in Computer Security.

Participants at the ICCEM Conference held in Covenant University

5.3 DEPARTMENT OF MECHANICAL ENGINEERING

OVERVIEW OF THE DEPARTMENT

The Department of Mechanical Engineering started in September 2005 (2005/2006 Academic Session). The Department offers the Bachelor's (Honours) Degree (B.Eng) in Mechanical Engineering. The duration of the Degree Programme is five (5) years of ten (10) semesters. However, based on the need to enlarge the scope of the Department in order to meet the demand for technological development and promote industrialization in the country, the Department of Mechanical Engineering is proposing to increase the number of Programmes to four (4). These are (B.Eng) in Mechanical Engineering, (B.Eng) Materials & Metallurgical Engineering, (B.Eng) in Industrial and Production Engineering and (B.Eng) in Mechatronics Engineering. All the students in the Programmes will be required to take the same courses at the 100 and 200 Levels. The alignment with the individual programmes will begin at the 300 Level and continue up to the 500 Level.

Vision

The Vision of the Department is to be nationally and internationally recognized as a leader in academic excellence with superior reputation in teaching, research and professional services and with a commitment to produce a new generation of leaders.

Mission

The Mission of Covenant University is to liberate mankind through the provision of the relevant university education for the society, that is by training students to become productive and resourceful people and agents of change. Similarly, the University aims at advancing the mental dignity of the human race, particularly Africans, who have largely lost their mental bravery to colonial entanglements. The Department therefore aligns itself with this Mission and aims at equipping men and women, its students, to face the challenges of life.

Philosophy

The Philosophy of the Programmes is derived from the departure philosophy of Covenant University. It is to marry theory with practice effectively and hence produce graduates who will be empowered to strengthen the weak or virtually non-existent manufacturing base of Africans and change the status of our industries from being 'packaging' industries to 'manufacturing' industries.

Objectives

In pursuance of its Philosophy and in line with the entrepreneurship and Total Man Concept goals of Covenant University, the Department of Mechanical Engineering will lay emphasis on the following objectives, which are to:

i. facilitate a good grasp of a broad spectrum of engineering principles;
ii. facilitate acquisition of practical work experience;
iii. inculcate entrepreneurial, marketing, and management skills in students;
iv. engage extensively in mechanical engineering research and development;
v. train and produce men and women who will be alert to the engineering needs of their environment and be willing and eager to meet those needs;
vi. train and produce men and women who are equipped with the necessary tools (theoretical, spiritual, physical and intellectual) to design and manufacture machines and components for the benefit of their environment and mankind in general; and
vii. bring out the best in the students through adequate exposure to theory, current trends and state of the art laboratory and industrial facilities.

Students working with Mechanical machine in one of the EIE laboratories

LIST OF ACADEMIC STAFF IN THE DEPARTMENT

S/N	NAME	QUALIFICATION	STATUS	PROGRAMME	AREA OF SPECIALIZATION
1.	Prof. F. A. Oyawale	BSIE, M.Sc, Ph.D, MNSE, Reg. Engr COREN	Professor/ HOD	Mechanical Engineering	Industrial/ Manufacturing
2.	Prof. C. A. Loto	B.Sc, M.Sc, Ph.D, C. Engr, Reg. Engr	Professor	Mechanical Engineering	Corrosion, Metallurgy & Materials
3.	Prof. A. O. Inegbenebor	B.Sc, M.Sc, Ph.D, C. Engr, Reg. Engr, COREN, MNSE	Professor	Mechanical Engineering	Corrosion, Metallurgy & Materials
4.	Dr. O. O. Ajayi	B.Sc, M.Eng, Ph.D	Associate Professor	Mechanical Engineering	Energy System/Machine Design & Production
5.	Dr. S. O. Adeosun	B.Sc, M.Eng,Ph.D, COREN, MNSE	Associate Professor	Mechanical Engineering	Metallurgy & Materials
6.	Dr. R. J. O. Ekeocha	B.Sc, M.Sc, Ph.D, FNSE, COREN, IACE	Senior Lecturer	Mechanical Engineering	Industrial & Manufacturing
7.	Dr. S. O. Oyedepo	B.Eng, M.Sc, Ph.D	Senior Lecturer	Mechanical Engineering	Thermo-fluid/ Thermo Power Plant
8.	Dr. J. O. Okeniyi	B.Sc, M.Sc, Ph.D, COREN, MNSE, NIMechE	Lecturer I	Mechanical Engineering	Corrosion Engineering
9.	Engr. O. A. Omotosho	B.Eng, M.Eng	Lecturer I	Mechanical Engineering	Production Design
10.	Dr. O. S. Ohunakin	B.Sc, M.Sc, Ph.D, COREN, MNSE, NIMechE	Lecturer I	Mechanical Engineering	Thermo-fluid/Power Plant & Energy Systems
11.	Engr. R. O. Leramo	B.Eng, M.Sc	Lecturer II	Mechanical Engineering	Design & Production
12.	Engr. O. Kilanko	B.Sc, M.Sc	Lecturer II	Mechanical Engineering	Machine Design & Production
13.	Engr. P. O. Babalola	B.Eng, M.Sc	Lecturer II	Mechanical Engineering	Engineering Materials
14.	Engr. (Mrs.) O. Joseph	B.Eng, M.Eng	Lecturer II	Mechanical Engineering	Engineering Materials Failure Analysis
15.	Mr. R. T. Loto	B.Tech, M.Sc	Lecturer II	Mechanical Engineering	Corrosion/ Metallurgy & Materials.
16.	Mr. A. K. Aworinde	B.Tech, M.Sc	Assistant Lecturer	Mechanical Engineering	Engineering Materials
17.	Mr. F. A. Ishola	B.Tech, M.Sc	Assistant Lecturer	Mechanical Engineering	Design & Production
18.	Mr. O. O. Olatunji	B.Tech, M.Sc	Assistant Lecturer	Mechanical Engineering	Design & Production

VISITING LECTURERS

S/N	NAME	QUALIFICATION	STATUS	PROGRAMME	AREA OF SPECIALIZ-ATION
1.	Prof. O. Fagbenle	Ph.D	Professor	Mechanical Engineering	Energy Systems
2.	Prof. Adekoya	Ph.D	Professor	Mechanical Engineering	Machine Design
3.	Dr. S. J. Ojolo	Ph.D	Senior Lecturer	Mechanical Engineering	Production
4.	Dr. Dirinfo	Ph.D	Senior Lecturer	Mechanical Engineering	Production

TECHNICAL STAFF

S/N	NAME	QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	Engr. C. O. Ajayi	HND, Mech. Eng., COREN	Assist. Chief Technologist	Metal Working Machines & Techniques (manufacturing)
2.	Engr. T. K. Makun	M.Sc Met Engineering	Assist. Chief Technologist	Steel making Metallurgy of Ferrow Merger
3.	D. H. Olugboye	HND Mech. Eng.	Senior Technologist	Mechanical Engineering
4.	J. Ocheja	B.Sc	Senior Technologist	Metal Fabrication/Welding
5.	I. O. Fayomi	M.Tech Metallurgy & Material	Technologist I	Material, Production and Corrosion
6.	O. P. Abioye	HND, PGD, MNTE	Technologist I	Applied Mechanics
7.	Engr. T. Adekeye	HND, PGD Mech. Engr.	Technologist I	Thermo-fluid
8.	S. Banjo	HND, NATE, NIMECH	Technologist I	Thermo-fluid/ Machine of M/C
9.	D. S. Adelekan	HND Mech. Eng.	Technologist II	Production
10.	T. O. Babarinde	B.Eng.	Technologist II	Production/Machining
11.	A. K. Makinde	City and Guild	Technician	Foundry and Material Casting
12.	K. Olaniyi	Federal Trade Test	Technician	Welding & Fabrication
13.	I. G. Odewole	Diploma F.T.C.	Technician	Motor Vehicle Technology
14.	J. Siyanbola	Federal Trade Test	Technician	Machinist

ADMINISTRATIVE STAFF

S/N	NAME	QUALIFICATION	STATUS
1.	Mrs. Rotimi Omolola	B.Ed, M.Ed	Assistant Registrar
2.	Mrs. James Mary	WASC	Receptionist

5.3.1 MECHANICAL ENGINEERING PROGRAMME

PROGRAMME: Mechanical Engineering

DEGREE AWARDED: B.Eng Mechanical Engineering

DURATION: Five 5 Years (10 Semesters)

ADMISSION REQUIREMENTS

The minimum requirement for admission into B.Eng Mechanical Engineering Programme is O/L SSCE/GCE/NECO Credit level pass in five (5) subjects, including English, Mathematics, Physics, Chemistry, and either credit pass in Further Mathematics, Biology, or Technical Drawing.

GRADUATION REQUIREMENTS

To graduate from the 5-year Bachelor of Engineering (B.Eng.) Degree Programme in Mechanical Engineering, a student must have successfully completed a minimum of 211 Credit Units as shown below:

Graduation Required Units for (B.Eng.) Mechanical Engineering

Level	Core /Compulsory	Electives	SWEP	Industrial Training [SIWES]	College Courses	University Courses	NUC Courses	Total
100	31					4	10	**45**
200	38		0			4	6	**48**
300	41					4	2	**47**
400	23			6		2		**31**
500	24	12				4		**40**
Total	**157**	**12**	**0**	**6**	**0**	**18**	**18**	**211**

COURSE STRUCTURE

100 Level Mechanical Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC117	Technical Drawing	C	2		α
	MAT111	Mathematics I: Algebra	C	3		α
	MAT112	Mathematics II: Trigonometry and Geometry	C	2		α
	PHY111	Mechanics and Properties of Matter	C	2		α
	PHY112	Heat, Sound and Optics	C	2		α
	PHY119	Physics Practicals IA	C	1		α
	CHM111	General Physical Chemistry	C	3		α
	CHM119	General Chemistry Practical I	C	1		α
	MAT121	Mathematics V: Calculus	C	3		Ω
	MAT122	Mathematics VI: Vector Algebra	C	2		Ω
	PHY121	Electricity and Magnetism I	C	2		Ω
	PHY122	Atomic and Nuclear Physics	C	2		Ω
	PHY129	Physics Practicals IIB	C	1		Ω
	CHM121	General Organic Chemistry	C	2		Ω
	CHM122	General Inorganic Chemistry	C	2		Ω
	CHM129	General Chemistry Practical II	C	1		Ω
University Courses	EDS111	Entrepreneurial Development Studies I	V	1		α
	TMC111	Total Man Concept I	V	1		α
	TMC112	Total Man Concept - Sports	V	0		α
	EDS121	Entrepreneurial Development Studies II	V	1		Ω
	TMC121	Total Man Concept II	V	1		Ω
	TMC122	Total Man Concept – Sports	V	0		Ω
NUC General Courses	CST111	Use of Library, Study Skills and Information Communication Technology I	U	2		α
	GST111	Communication in English I	U	2		α
	CST121	Use of Library, Study Skills and Information Communication Technology II	U	2		Ω
	GST121	Communication in English II	U	2		Ω
	GST122	Communication in French	U	2		Ω
			α =22 Ω = 23 Total = 45 Units			

200 Level Mechanical Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	GEC210	Engineering Mathematics I	C	2	MAT111, MAT 112	α
	GEC211	Introduction to Electrical Engineering I	C	2		α
	GEC212	Engineering Graphics	C	2	GEC117	α
	GEC213	Materials Science and Engineering	C	2		α
	GEC214	Applied Mechanics	C	3		α
	GEC215	Applied Computer Programming I	C	2	CST111	α
	GEC216	General Engineering Laboratory I	C	3		α
	GEC217	Engineer-In-Society	C	1		α
	GEC218	Workshop Technology	C	2		α
	GEC220	Engineering Mathematics II	C	2	MAT121 MAT122	Ω
	GEC221	Thermodynamics	C	2		Ω
	GEC222	Computer Aided Design and Manufacture	C	2		Ω
	GEC223	Fluid Mechanics I	C	2		Ω
	GEC224	Strength of Materials	C	2		Ω
	GEC225	Applied Computer Programming II	C	2		Ω
	GEC226	General Engineering Laboratory II	C	3		Ω
	GEC227	Electrical Measurement and Instrumentation	C	2		Ω
	GEC228	Introduction to Electrical Engineering II	C	2		Ω
SWEP	GEC229	Student Workshop Experience Programme (SWEP)	S	0		Ω
University Courses	EDS211	Entrepreneurial Development Studies III	V	1	EDS111	α
	TMC211	Total Man Concept III	V	1	TMC111	α
	TMC212	Total Man Concept - Sports	V	0	TMC112	α
	EDS221	Entrepreneurial Development Studies IV	V	1	EDS121	Ω
	TMC221	Total Man Concept IV	V	1	TMC121	Ω
	TMC222	Total Man Concept - Sports	V	0	TMC122	Ω
NUC General Courses	GST211	Logic, Philosophy and Human Existence	U	2	GST111	α
	GST221	Nigerian People and Culture	U	2	GST121	Ω
	GST222	Peace Studies and Conflict Resolution	U	2	GST122	Ω
α =23 Ω = 25 Total = 48 Units						

300 Level Mechanical Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC310	Engineering Mathematics III	C	3	GEC210	α
	MCE310	Machine Drawing	C	2		α
	MCE311	Thermodynamics II	C	2		α
	MCE312	Mechanics of Machines I	C	2	GEC214	α
	MCE313	Manufacturing Technology	C	2		α
	MCE314	Workshop Practice	C	2	GEC218	α
	CVE318	Strength of Materials II	C	2		α
	MCE317	Fluid Mechanics II	C	2	GEC223	α
	MCE316	Introduction to Metallurgy	C	2		α
	MCE318	Computer and Computing I	C	2		α
	GEC320	Numerical Methods	C	2	GEC310	Ω
	GEC324	Technical Communication	C	1		Ω
	GEC321	Engineering-in-Society II	C	1		Ω
	MCE320	Introduction to Automotive Engineering	C	2		Ω
	MCE321	Computer and Computing II	C	2	GEC225	Ω
	MCE322	Mechanics of Machines II	C	2	GEC224	Ω
	MCE323	Strength of Materials Laboratory	C	1	GEC224	Ω
	MCE324	Applied Strength of Materials	C	2	GEC224	Ω
	MCE326	Fluid Dynamics: Aerodynamics and Hydrodynamics	C	2	GEC223	Ω
	MCE325	Mechanics of Machines Laboratory	C	1		Ω
	MCE327	Technology Management	C	3		Ω
	CVE328	Elements of Archictecture	C	1		Ω
University Courses	EDS311	Entrepreneurial Development Studies V	V	1	EDS211	α
	TMC311	Total Man Concept V	V	1	TMC211	α
	TMC312	Total Man Concept – Sports	V	0	TMC212	α
	EDS321	Entrepreneurial Development Studies VI	V	1	EDS321	Ω
	TMC321	Total Man Concept VI	V	1	TMC221	Ω
	TMC322	Total Man Concept – Sports	V	0	TMC222	Ω
NUC General Course	GST 311	History and Philosophy of Science	U	2		α
			α =25 Ω = 22 Total = 47 Units			

400 Level Mechanical Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC410	Probability and Statistics	C	2		α
	MCE411	Thermodynamics III: Refrigeration and Airconditioning	C	2		α
	MCE412	Machine Design I	C	3	GEC214 CVE315	α
	MCE413	Engineering Metallurgy, Foundry and Welding Engineering	C	3		α
	MCE414	Modeling and Simulation in Mechanical Engineering	C	2		α
	MCE415	Thermodynamics and Fluids Laboratory	C	1	MCE311	α
	MCE416	Fluid Power Systems	C	2	MCE322	α
	MCE417	Foundry Practice and Metallurgical Laboratory	C	1		α
	MCE418	Applied Thermodynamics	C	2		α
	MCE419	Metrology and Instrumentation	C	2		α
	EIE412	Control Systems	C	3		α
University Course	EDS411	Entrepreneurial Development Studies VII	V	1	EDS311	α
	TMC411	Total Man Concept VII	V	1	TMC311	α
	TMC412	Total Man Concept – Sports	V	0	TMC312	α
SIWES (Industrial Training)	GEC429	Student Industrial Work Experience Scheme SIWES [IT]	S	6	GEC229	Ω
			α =25 Ω = 6 Total = 31 Units			

Students working with Core Saw Cutting Machine at Engineering Workshop

500 Level Mechanical Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	MCE510	Research Methodology	C	1		α
	MCE513	Fluid Machinery	C	3		α
	MCE515	Machine Design II	C	3		α
	MCE 519	Project 1	C	0		α
	MCE552	Thermodynamics IV: Thermal Power and Propulsive Systems	C	3	GEC221	α
	MCE553	Internal Combustion Engines	C	2	GEC221	α
	MCE524	Heat Transfer	C	2		Ω
	MCE525	Engineering Vibrations	C	2		Ω
	MCE541	Engineering Economics	C	1		Ω
	MCE542	Building Services	C	1		Ω
	MCE529	Project II	C	6		Ω
Electives	***Note: Select 6 Units from these electives***					
	MCE517	Energy Management and Technology	E	3		α
	MCE518	Corrosion Science and Engineering	E	3		α
	MCE500	Analytical Dynamics	E	3		α
	MCE501	Introduction to Robotics	E	3		α
	MCE502	Production Engineering I	E	3		α
	MCE503	Synthesis of Mechanisms	E	3		α
	MCE504	Welding Engineering	E	3		α
	MCE505	Tribology	E	3		α
	MCE521	Automotive Engineering	E	3	MCE320	Ω
	MCE526	Machine Maintenance and Overhaul Technology	E	3		Ω
	MCE527	Introduction to Mechatronics	E	3		Ω
	MCE528	Production Engineering II	E	3		Ω
	MCE540	Industrial Engineering	E	3		Ω
	MCE543	Work Design and Ergonomics	E	3		Ω
	MCE544	Material Handling and Equipment	E	3		Ω
	MCE545	Pipeline Engineering	E	3		Ω
University Courses	EDS511	Entrepreneurial Development Studies IX	V	1		α
	TMC511	Total Man Concept IX	V	1		α
	TMC512	Total Man Concept - Sports	V	0		α
	EDS521	Entrepreneurial Development Studies X	V	1		Ω
	TMC521	Total Man Concept X	V	1		Ω
	TMC522	Total Man Concept - Sports	V	0		Ω
			α =20 Ω = 20 Total = 40			

COURSE DESCRIPTION

100 Level

Alpha Semester

GEC117 - Technical Drawing I (2 Units)
Introduction to engineering drawing as a means of communication, use of drawing instruments, drawing paper format, types of lines and their uses in engineering drawing, plane geometry, circles and tangents, conic sections, Loci (cycloid, epicycloids, hypocycloid, involute, Archimedean spiral, Eclipse, hyperbola, parabola, including approximate method), theory of projection, parallel projection, orthographic projection, axonometric projection, perspective projection multiview representation, 1st and 3rd angle projection, isometric drawings, oblique drawings, Freehand sketching.

MAT111 - Mathematics I: Algebra (3 Units)
Algebra of set theory: Definition of concepts, laws of algebra of sets, Venn diagram and application. Real Numbers: Rational numbers, theory of surds, sequences and series (including AGP), binomial theorem, theory of quadratic, cubic and quartic equations, indices and logarithms, mathematical induction, partial fractions, theory of equations, inequalities and polynomials (including factor and remainder theorems). Complex Numbers: Algebra of complex numbers, Argand diagram, multiplication and division of numbers in polar form, nth root of unity, and DeMoivre's theorem, expansion of sin nØ, cos nØ, tan nØ.

MAT112 - Mathematics II: Trigonometry and Geometry (2 Units)
Trigonometry and analytic geometry in (2-D & 3-D): Elements of trigonometry, circular measure, elementary treatment of circles, coordinate geometry: straight lines in (2B-D); plans. Functions and relations: permutation and algebra of functions, Binary operations, Permutations and combinations, elementary treatment of logic.

PHY111 - Mechanics and Properties of Matter (2 Units)
Units and dimensions, scalars and vectors, particle kinematics, Newton's laws, friction, work, energy, centre of mass, simple harmonic motion, rigid body dynamics, kepler's laws, pressure in fluids, intermolecular forces, Hooke's law, Young's modulus, fluid flow streamline turbulence, stroke's law, surface tension.

PHY112 - Heat, Sound and Optics (2 Units)
Temperature, thermometers, heat transfer, PVT –surfaces, Kinetic theory, first and second laws of thermodynamic, transverse and longitudinal waves, standing waves, intensity, beats. Doppler Effect, Electromagnetic spectrum. Huygen's principle, images formed by a single surface thin lenses, aberrations, the eye, optical instruments, interface, single slit, diffraction grating, polarization, Malus' law.

PHY119 - Physics Practicals IA (1 Unit)
A selection from the following experiments use of measuring instruments, viscosity, surface tension oscillations about an equilibrium position, Hooke's law, moment of inertia, focal lengths of lenses, refractive index, optical instruments, the sonometer heat capacity, volume expansion and latent heat.

CHM111 - General Physical Chemistry (3 Units)
Historical development of the atom: atoms, Dalton's atomic theory, atomic masses. Fundamental particles of the atomic structure. Modern electronic theory of atoms. Periodicity of the elements. Stoichiometry mole concept, chemical formulas, equations and calculations. State of mater; gas, liquid and solid. Chemical energetics and thermo chemistry. Chemical kinetics, equilibria and electrochemistry.

CHM119 - General Chemistry Practical 1 (1 Unit)
Quantitative inorganic and organic analysis for elements in Groups I, II, IIIA, IIIB, IV. Chemical analysis for functional groups: acidic, kenotic carboxylic, etc.

Omega Semester

PHY121- Electricity and Magnetism I (2 Units)

Coulomb's law, ohm's law, Gauss' Law, capacitors, Ohm's law, Kirchoff's laws, Electrical energy, DC bridges, potentiometer, magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometers, multi-meters, DC and AC motors and generators, hysteresis, power in AC circuits, semiconductors, conductivity and mobility, rectification.

PHY122 - Atomic and Nuclear Physics (2 Units)

Theory of atomic structure, Thompson, Rutherford and Bohr's theories, the hydrogen atom, properties of the electron, e/m, CRO, Millikan's experiment, properties of the nucleus, natural radioactivity, wave particle duality of light, x-rays, photo electricity, thermionic emission, diode valve.

PHY129 - Physics Practical IIB (1 Unit)

A selection from the following experiments, potential difference and internal resistance of cells, uses of potentiometer circuit, the meter bridge, simple direct current measuring instruments, Planck's constant, radioactivity.

MAT121 - Mathematics V: Calculus (3 Units)

Functions of Real Variables: Graph, Limits and Concepts of Continuity. Techniques of Differentiation of Algebraic and Trigonometric Functions, Higher Order Derivates, Maxima and Minimal, Leibnitz Rule, Application of Differentiation. Integration as Inverse of Differentiation, Methods of Integration, Definite Integra. Application to Areas, Volumes, Moment of Inertial. Approximate Integration: Trapezoidal and Simpson's Rule. Taylor's and Mclaurin's Theorems, partial Differentiation and Implicit Differentiation.

MAT122 - Mathematics VI: Vector Algebra (2 Units)

3-Dimensional Cartesian Coordinate Systems. Definition and Representation of Vectors, Algebra of Vectors, Multiplication of a Vector by a Scalar, Addition of Vectors, Scalar Products of two Vectors, Direction Cosines, Calculus of Vector Functions, Differentiation of Vector Function, Integration of Vector Function. Conic: Circles, Parabola, Ellipse and Hyperbola.

CHM121 - General Organic Chemistry (2 Units)
Historical survey of the development and importance of organic chemistry. Nomenclature and classes of organic compounds. Homologous series, functional groups, isolation and purification of organic compounds. Qualitative and quantitative organic chemistry, stereochemistry, determination of structure of organic compounds. Electron theory in organic chemistry; saturated hydrocarbons, unsaturated hydrocarbons.

CHM122 - General Inorganic Chemistry (2 Units)
Periodic table and periodic properties, chemical bonding, structures of solids. The chemistry of selected representative elements. Quantitative analysis, hybridization.

CHM129 - General Chemistry Practical II (1 Unit)
Qualitative inorganic and organic analysis for elements in Groups I, II, IIIA, IIIB, IV. Chemical analysis for functional groups: acidic, kenotic, carboxylic, etc.

200 Level

Alpha Semester

GEC210 - Engineering Mathematics I (2 Units)
Functions, inverse trigonometric functions and principal values, hyperbolic & its inverse, graphs. Concepts of continuity and differentiability. Mean-value theorem. Taylor's series expansion. Integration by parts. Sequences: real numbers, monotone, convergence, limits. Infinite series: convergence tests, addition, multiplication. Power

series, radius of convergence, integration, differentiation. Real and imaginary parts, the complex plane, terminology and notation. Complex algebra, DeMoivre's theorem, powers and roots of complex numbers. Euler formula. Elementary functions of a complex variable, polynomials, rational, exponential, trigonometric, hyperbolic, logarithmic, inverse trigonometric and inverse hyperbolic functions. Vectors in R^n space, addition and scalar multiplication, linear combination of vectors, idea of linear dependence and independence. Dot and cross products, triple products, lines and planes.

GEC211 - Introduction to Electrical Engineering I (2 Units)

Recommended Text: Basic Electrical Engineering by E.C. Bill and R.W. Whitehead. ISBN: 0-00-383315-1. Fundamentals of electric, electromagnetic and electrostatic circuits. Transients in RC and RL dc circuits. Steady-state dc circuit analysis: Source conversion, Kirchoff's laws, Mesh analysis, nodal analysis, Thevenin and Norton theorems, superposition principle, star-delta transformation, Maximum power transfer. Steady-state ac circuit analysis: Phasors and phasor diagrams, Power triangle, power factor and power factor improvement, frequency response of RLC circuits, resonance. Introduction to simple diode and transistor circuits and characteristics: Amplification & rectification. Introduction to digital systems.

GEC212 - Engineering Graphics (2 Units)

Introduction, Uses and types of Engineering drawing, Dimensioning, Principle of Tangency, Orthographic projection, Isometric projection, Oblique projection (with harder examples), Auxiliary Views, Sectioning, True length of Lines and shapes, Interpenetration of Solids, Development of Surfaces, Introduction to Electronic drafting and Architectural drawings. Freehand or Technical drawings (with harder examples), Machine Drawing, Graphical calculus, electrical and communication, and IT symbols and introduction to assembly drawing, working drawings.

GEC213 - Materials Science and Engineering (2 Units)
Introduction, Atomic structure & interatomic bondings. The structure of crystalline solids. Imperfections in solids. Diffusion. Mechanical properties of medals. Dislocations and strengthening Mechanisms. Corrosion; effects and control. Failure phase diagrams. Phase transformations in metals. Development of microstructure and alteration of mechanical properties. Thermal processing of metal Alloys. Metal alloys. Structure, Properties, characteristics, applications and processing of polymers, ceramics and composites. Electrical properties.

GEC214 - Applied Mechanics (3 Units)
Statics: Principles of mechanics. Forces, Moment Couples, Laws of Mechanics. Coplanar forces and their resultants. First and Second Moments of area. Centroids. Distributed line loads and their resultants. Application of vectors to resolution of forces. Equilibrium of particles. Free body Diagrams. Dynamics: Kinematics of particles and rigid body kinematics in plane motion. Application of Newton's laws of motion. Rigid body translation, rotation about fixed axis and the velocity and acceleration of general plane motion. Relative motion of two particles. Dependent motion of particles. Instantaneous centre of rotation. Kinetics of particles, kinetic energy; principles of ware and energy impulse and momentum analysis.

GEC215 - Applied Computer Programming I (2 Units)
Software development life cycle (SDLC): Definitions, SDLC models: Waterfall model, V-shaped model, Incremental Model, Spiral Model. Program Design: Algorithms: Key features of algorithms and different ways of presenting algorithms. Flow charting of algorithms. Pseudocode: Pseudocode statements for Input, Output, Iteration, Decision, and processing, Arithmetic, Relational and Logical Operations in Pseudocodes, use of sub-process in Pseudocode. Introduction to QBASIC Programming: Symbols, Keywords, Identifiers, Data Types, Operators, Control Structure, Functions, Procedures. Arrays: 1-D and Multidimensional Arrays. File handling: Concept of files, files and streams, standard file handling functions binary files, random access files.

GEC216 - General Engineering Laboratory 1 (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to Electrical Engineering, Materials Science, Applied Mechanics, Applied Computer Programming I and Workshop Technology Courses.

GEC217 - Engineer-In-Society (1 Unit)

Science, Technology and Development: Ethical concepts of development. Indicators of development, and the role of science and technology. The contribution of the Government to the process of development and the Nigerian experience in the process of economic development Nigerian Five Year Development Plans, successes and setbacks). Limits of growth, appropriate technology and a new world of science and technology. Science, Technology and Society: The inter-relationship of social ethics and values, and science and technology. Societal needs and resources in the genesis and development of science and technology. Social problems, impact assessment, and control of science and technology. Responsibilities of engineers. Science, Technology and Environment: Disruption or enhancement of environmental quality through harmful or sound science and technology in relation to air, space, water, land, populations, agriculture, industry, wild life, human settlements, culture, education, etc. Ethics and Professionalism: Theistic and secular concepts of personal, social and professional ethics. Codes of conduct of engineers. Motivation, control, responsibility, rewards and accountability of engineers and development of an ethical engineering professionalism. Council of Engineers and Engineering Societies.

GEC218 - Workshop Technology (2 Units)

Introduction to engineering workshop practice covering mechanical, electrical, information engineering, civil, chemical, and petroleum engineering. Machine operation practice. Use of hand tools, and safety measures in these fields.

Omega Semester

GEC220 - Engineering Mathematics II (2 Units)
Partial Differentiation: Functions of several variables, continuity and partial derivatives. Total differentials, approximate calculations using differentials. Chain rule. Implicit differentiation. Series representation of functions (Maclaurin & Taylor's), Taylor's Theorem. Extremum problems, (analytic method) without and with constraints, Lagrange multipliers, global extremum. Ordinary Differential Equations: Definition, degree, order, linear, non-linear, solution. First order equations, separable variables, equations reducible to separable form, exact equations, integrating factors, homogenous differential equations. Modeling of engineering systems leading to first order differential equations- electric circuit, mixing/dilution, radioactive decay, bacterial culture. 2^{nd} order differential equations with constant coefficients, homogeneous, non-homogeneous, complementary functions, particular integrals, D-operator method. General linear second-order differential equations (without using matrices). Power series solution, Legendre's differential equation. Modeling of engineering systems leading to 2^{nd} order differential equations- electric circuit, mechanical oscillations-free and forced, resonance. Matrices and Determinants: Solution of system of linear equations by determinants. Linear dependence and independence, rank of a matrix. General system of linear equations, existence and properties of solution, Gaussian elimination. Matrix inverse by elementary matrices, adjoint, and partitioning methods. Characteristic polynomial, characteristic equation, eigenvalues and eigenvectors.

GEC221 – Thermodynamics (2 Units)
Basic concepts, energy and energy conversions and surroundings, temperature of scales, quantitative relations of zeroth, first, second and third laws of thermodynamics. Steady flow energy equations. Heat and work. Behaviour of pure substances and perfect gases. Applications of the first law. Use of steam tables and charts.

GEC222 - Computer Aided Design and Manufacture (2 Units)
Introduction to CAD/CAM, Area of its applications and importance. How CAD/CAM works. Extensive introduction to CAD package i.e. AutoCAD. Hand-on practical approach is used especially for CAD application.

GEC223 - Fluid Mechanics 1 (2 Units)
Introduction: Properties of fluids: Density, Pressure, surface tension, viscosity, compressibility etc. Fluid statics. Buoyancy of floating bodies. Fluid dynamics. Basic conservation laws. Friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamic similitude.

GEC224 - Strength of Materials (2 Units)
Forces, moments. Equilibrium of simple structures and machine parts. Hookes's law stresses and strains due to loading and temperature change. Stress circle. Deflection of beams. Shear forces and bending moments. Analytical and graphical methods for structures.

GEC225 - Applied Computer Programming II (2 Units)
Review of QBASIC and Introduction of Visual BASIC, Comparison of QBASIC and VBASIC. Creating applications. VBASIC Integrated Development Environment. Menu Design, Use of Procedures, Functions, Subroutines, and Event Procedures. Opening and Saving Pictures to folders. Writing to and Reading from files e.g. Notepad, Ms Word. Writing to and Reading from Database e.g. Access. Writing to and Reading from Text and database over the NET, Printing. Multimedia with VB: Sound, Music, and Video, Animation with VB. Calling other Applications from VB (Shell execute), html, pdf, doc, files.

GEC226 – General Engineering Laboratory II (3 Units)
Laboratory investigations and report submission on selected experiments and projects drawn from introduction to electrical Engineering, Materials science, Applied Mechanics, Applied computer Programming I, and Workshop Technology courses.

GEC227 - Electrical Measurements and Instrumentation (2 Units)
Instrumentation systems including transducers, signal conditioners, and read out devices. Oscilloscope, recorders, bridges. Measurement of voltage, current, resistance, impedance, frequency, phase difference, electric power, energy, force, displacement, temperature, flow, pressure, and other engineering parameters.

GEC228 - Introduction to Electrical Engineering II (2 Units)
Analysis of Magnetic circuits, Hysteresis and eddy currents, three phase circuits, three-phase power measurement, Transformer theory; short-circuit and open-circuit tests, voltage regulation, efficiency. Electrical machines; constructional features and operation of dc generators and motors; single-phase and 3-phase motors and generators, electric energy utilization for lighting and heating. Tariffs.

GEC229 - Student Work Experience Programme (SWEP) (0 Unit)
Introduction to practices and skills through supervised hands-on workshop exercises in each engineering departments: Mechanical Engineering (Fabrication, welding, Machining, Fondary, Automotive operations, etc), Chemical Engineering (bar and liquid soap, creams, paints, etc), Civil Engineering, Computer Engineering (soldering and desoldering, building of different circuits, etc), Petroleum Engineering, Electrical Electronics (surface and conduit wiring, etc), Information and Communication Technology (DSTV and Dish installation). Working in the construction site if available during the period. Introduction to Networking Operation Center (Satellite Broad casting), Bakery Operation (Bread Production), Water Table, sachet and Hebron Juice Production, Printing Technology, Fire fighting Exercise and other available related general engineering practice on campus. These exercises include familiarisation with basic tools, troubleshooting. Safety precautions in handling devices in each workshop.

300 Level

Alpha Semester

GEC310 - Engineering Mathematics III (3 Units)

Matrices and Determinants: Matrices, some special matrices, matrix operations. Determinants and some useful theorems. Laplace's development. Solution of system of linear equations by determinants. Linear dependence and independence, rank of a matrix. General system of linear equations, existence and properties of solution, Gaussian elimination. Matrix inverse by elementary matrices, adjoint, and partitioning methods. Characteristic polynomial, characteristic equation, eigenvalues and eigenvectors. Diagonalization of matrices, application to system of first order linear differential equations. Multiple Integrals: Iterated integrals, multiple integrals over elementary regions. Change of variables, Jacobians. Differentiation of integrals involving a parameter, Leibniz's rule. Vector Algebra: Vector field, gradient and directional derivative, divergence, curl. Line and surface integrals, Stoke's theorem. Volume integrals, divergence theorem. Orthogonal transformations, scale factors, basis vectors. Cylindrical and spherical polar coordinate systems, gradient, divergence and curl in these systems. Fourier Series: periodic functions, trigonometric series. Fourier coefficients, Parsevals theorem, Functions of arbitrary period, even and odd functions. Half range expansion. Complex form of Fourier series. Integral Transform: Derivation of transforms and inverses (Fourier and Laplace). Applications of these transforms in boundary and initial value problems. Z transforms. Partial Differential Equations: Elementary properties of Gamma, Beta, Error, Bessel functions and Legendre polynomials. Basic concepts of partial differential equations. Classification of 2nd order linear partial differential equation into basic types. The principle of superposition. The wave, diffusion and Poisson's equations. Boundary and initial-value problems. D'Alembert's solution for wave equation. Method of separation of variables. Biharmonic equation.

MCE310 - Machine Drawing (2 Units)
Introduction to machine drawing and its uses, use of standards, Conventional representation and specifications. Drawing layouts and Simplified Methods, Sections and Sectional Views, Dimensioning Principles, Screw Threads and Coventional Representations, Nuts, Bolts, Screws and Washers, Keys and Keyways, Limit and Fits, Geometric Tolerancing and Datums, Application of Geometric Tolerances, Maximum Material and Least Material Principles, Positional Tolerancing, Cams and Gears, Springs. Manual/Mechanical Drafting and the use of CAD Software (Autodesk Inventor Professional) for Mechanical Drafting (Detail drawing, Part Drawings Working, Assembly and of machine components).

MCE 311 - Thermodynamics II (2 Units)
Review of the Basic Concepts of Thermodynamics including first and second law. The second law of thermodynamics and its applications; Entropy; Exergy; Fuels and Combustion. Engine cycles, heat pump and refrigeration cycles. Gaseous mixtures.

MCE312 - Mechanics of Machines I (2 Units)
Fundamental concept in kinematics and motion, Mechanism, Instantaneous Center: Forces and motion relationships in constrained mechanisms. Relative velocity and accelerations in mechanisms, analysis of cam and followers, gear, linkage, belt drive and chain drive systems for motion and power transmission. Vehicular mechanism: brake and clutch systems. Velocity and acceleration diagrams of mechanisms, tongue diagrams; fluctuations of energy and speed. Introduction to analytical methods and computation in analysis of mechanism.

MCE313 - Manufacturing Technology (2 Units)
Definition of manufacturing technology, Casting Processes, pattern design and other foundry work, Forming processes (rolling, forging, extrusion, wire drawing, deep drawing, sheet metal operations, etc.), Fabrication processes (welding methods, brazing, soldering, diffusion and adhesive bounding, mechanical joining), metal removal processes (sawing, turning,

milling, drilling, shaping and planning, grinding, broaching, etc), Finishing operations (honing, lapping, polishing, burnishing, etc), break even analysis, design process and concurrent engineering, processing of plastics, ceramics and composites, introduction to some modern manufacturing technologies: rapid prototyping, powder metallurgy, lean and agile engineering, flexible manufacturing, computer numerical control machining, Micro-electronics processing, Virtual Manufacturing, Just In Time Manufacturing. etc

MCE314 - Workshop Practice (2 Units)
Workshops settings, types of equipment, machines and materials: Bench fitting and measurement, metal removal processes: sawing, turning, milling, drilling, grinding, etc. Fabrication processes and welding methods, sheet metal work. Foundry Practice: Pattern making Casting, Furnace Operation and Metallurgy Practice. Automotive engineering practice. Hands-on practical approach for all the students on all engineering workshop equipment. Safety procedures in workshops.

CVE318 - Strength of Materials II (2 Units)
Advance topics in bending moments and shear force in beams. Theory of bending of beams. Deflection of beams. Unsymmetrical bending and shear center, and applications Strain energy. Biaxial and triaxial state of stress. Transformation of stress. Mohr's circle, Failure theories, Springs, Creep, fatigue, fracture and stress concentration.

MCE317 - Fluid Mechanics II (2 Units)
Ideal viscous and compressible fluids under internal and external flow conditions. Inviscid Flow, boundary layer, vorticity and rotation of fluid particles. Flow through pipes and ducts. High and low Reynolds number flows. Two dimensional potential flows, Flow machines; cavitation.

MCE316 - Introduction to Metallurgy (2 Units)
Introduction to metallurgy, extraction and refining of metals, non – metals technology, foundry technology, iron and steel making processes. Production of ferrous and non – ferrous alloys. Alloying elements in steel

and their functions. Classification of steels. AISI – SAE designations for wrought steel and other metals. Metallurgy of Welding, soldering and brazing. History of Metallurgical processes in Nigeria.

MCE318 - Computer and Computing 1 (2 Units)
Programming with Fortran Packages, Ctt, Matlab, etc.

Omega Semester

GEC320 - Numerical Methods (2 Units)
Numerical Methods: Finite difference. Interpolation. Numerical differentiation and integration. Numerical solution of ordinary differential equations, Trapezoidal, Simpson, Runge Kutta methods. Newton Raphson method for roots of equations. System of simultaneous linear equations. Linear simultaneous equations, Gaussian elimination, Gauss-Seidel iterative method, Jacobi Method, evaluation of determinant and inverse matrix. Eigensystem analysis: system stability, eigenvalue sensitivity, stability of Gauss-Seidel solution, amplitude and time scaling for model studies. Use of numerical analysis software packages to solve simple engineering problems.

GEC321 – Engineer-in-Society II (1 Unit)
Introduction to engineering economy and law for engineers.

GEC324 - Technical Communication (1 Unit)
Introduction to Communications: Principles of effective communication in interpersonal and mass communication process. Verbal, graphical and numerical communications. Written Communication: Principles of technical writing. Types of technical writing, referencing and citation. Styles of writing. Graphs; diagrams presentation. Statistical information presentation. Macro level, and micro-level. Oral Communication: Public speaking skills, multi-media presentation skills. Facilitator and participant skills in meetings. Negotiating skills. Idea-generating skills. Manuscript speaking and presentation involving media and telecommunications.

Reading skills: Effective reading skills: extracting main ideas and speed-reading, chunk/cluster-reading and word-attack techniques of technical reading materials. Equipment Manual Writing and Presentation: Component diagrams, assembling, description, and multi-language presentation. Basic troubleshooting information, and technical support information marketing strategy.

MCE320 - Introduction to Automotive Engineering (2 Units)
Introduction to Automotive Engineering, Automotive shop safety, measuring systems and measuring tools, shop hand tools, shop equipment and power tools. How engine works: Fundamentals of engine operations, electricity and electronic engine controls, piston-engine operations, engine types and classifications, engine construction, valves and trains, Engine measurement and performance. Fuel supply systems. Fault diagnosis methods, Hand-on practical demonstration.

MCE321 - Computer and Computing II (2 Units)
Mechanical simulation packages and computational fluid dynamics.

MCE322 - Mechanics of Machines II (2 Units)
Static and inertia force analysis in machine. Static and Dynamic equivalent systems. Kinetics and balancing of rotating and reciprocating masses and the balancing of their out-of-balance forces. Flywheel, Governors, Gyroscope motion and forces. Power transmission, belts, coupling; gearing between parallel shafts, epicycle gearing. Friction clutches; Cone and plate tubes. Friction in machines (bearing clutches, etc), Free and forced vibration. Critical speeds, whiling of shaft, vibration isolation, transmissibility.

MCE323 - Strength of Materials Laboratory (1 Unit)
Based on the theoretical course contents of Strength of Material (GEC224) and Strength of Material II (CVE316). Shear centre Apparatus; Measurement of Bending Forces; Suspension Bridge; Two Hinged Arch; Unsymmetrical Cantilever; Torsional Apparatus.

MCE324 - Applied Strength of Materials (2 Units)
Concepts of Stress and Strain, Torsion, Failure Theory. Design of Beams and Shafts for Strength. Columns. Thick walled cylinders; Compound cylinders. Rotating disks. Bending of flat plates. Beams on an elastic foundation. Membrane stresses in shells of revolution. two-dimensional theory of elasticity. Elementary Plasticity and Elastoplastic, problems, torsion of non-circular section. Limit theory.

MCE325 - Mechanics of Machine Laboratory (1 Unit)
Based on the theoretical course content of Mechanics of Machine I (MCE312) and Mechanics of Machine II (MCE322).

MCE326 - Fluid Dynamics: Aerodynamics and Hydrodynamics (2 Units)
Thermodynamic and dynamic principles applied to fluid behaviour; stagnation conditions, speed of sound, Mach number and classification of flow, isentropic, Rayleigh, Fanno, Prandtl-Meyer, and shock. Stream function and velocity potential. Vortex and circulation, Viscous flow; boundary layers, separation and turbulent flow. External flows, Lift and drag, thin air fool theory, Finite wing theory and airfool design.

MCE327 - Technology Management (3 Units)
Introduction - Technology and technological innovation; Specific issues and general; Innovation and competitive advantage; Types of innovation; the importance of incremental innovation; Innovation as a knowledge-based process; the challenge of discontinuous innovation. The Management of Research and Development – What is R & D; Basic and Applied Research; Centralized and Decentralized R&D; Managing Research Teams; Evaluation and Assessment of R&D. The Management of New Product Development - What is a new product? The potential benefits of new product development; What makes a firm innovative in its new product development; Internal organizational integration for new product development; The importance of coordination in new product development; Human resource management factors in new product development; Project management techniques in new product development; Failure in new product development. The management of

Operations and Production – What are operations and production and why are they important; Some techniques of operation and production management; Lean production; Investment appraisal techniques; Manufacturing strategy. Technology Strategy – Why technological innovation is a strategic management issue; Technology strategy; Technological competencies; Learning and Technology strategy. Technological Collaboration – Introduction; Why firms collaborate in Technological activities; The extent of Technological collaboration; The challenges of managing Technological collaboration; Trust and Technological collaboration. The Commercialization process – What is Commercialization process?; Marketing Technology products; Intellectual Property right and know-how; Licensing; Technology Pricing; Technical standards; Technology transfer. Some future challenges for the management of Technological Innovation.

CVE328 – Elements of Architecture (1 Unit)

Introduction – Dimensional awareness, graphic communicaton, relation to environmentals. Free-hand drawing – form in terms of; perspective projections; applications. Orthographic drawing, common curves. Elementary deesigns. Shades light and shadow. Diametrics.

400 Level

Alpha Semester

GEC410 - Probability and Statistics (2 Units)

Probability and Statistics: Probability space, theorems. Conditional probability and independence. random variables, discrete and continuous distributions, mean and variance. Bernouli, Binomial, Poisson, hypergeometric, exponential, normal distributions and their characteristics. Examples of experimental measurement and reliability. Elementary sampling theory for normal population. Central limit theorem. Statistical inference (point and interval estimation and hypothesis testing) on means, proportions and variances. Power and operating characteristics of tests. Chi-squares test of goodness of fit. Simple linear regressions.

MCE411 - Thermodynamics III: Refrigeration and Air-Conditioning Engineering (2 Units)
Refrigeration cycles, types of refrigeration system, refrigeration equipment, refrigerants and their selections and applications, psychometrics of air processes, adiabatic mixing of air streams, humidification and dehumidification, comfort conditions, ventilation, air analysis, air contaminants, decay equations, air cleaning devices, air distribution systems. Refrigeration cycles; Ideal Gas mixture; Psychrometrics.

MCE412 - Machine Design I (3 Units)
Introduction to Mechanical Engineering Designs, factor of safety, Use of Codes, Charts, Table, Standard and Empirical Data in Mechanical Designs. Presentation of Design Portfolio. Review on Load and Stress Analysis, Analysis and design of individual machine components: Shaft and associated parts, Bearings and Lubrication, Flexible machine elements.

MCE413 - Engineering Metallurgy, Foundry and Welding Engineering (3 Units)
Chemical Metallurgy, Physical Metallurgy, Mechanical Metallurgy and Powder Metallurgy. Moulding Processes: Patterns, Moulding Tools and Flasks. Initial Materials, properties and Types of Moulding and Core Sands: Sand Preparation for Moulding and Core making. Moulding Processes; core making; Gating Systems. Foundry furnaces, Types and Properties of Castings, Pouring and Cleaning Castings: Charging Materials; Foundry furnaces; Types and properties of Iron and Steel Castings; Casting properties of Alloys; Pouring, Shakeout and Cleaning. Solidification of Metals. Special Casting and Moulding Processes; Permanent Mould Casting; Centinfugal Casting; Die Casting; Investment Casting; Shell Moulding. Quality Control in the Foundry. Casting Defects and Salvaging Operations: Purpose and Methods of Quality

Control; Casting Defects and Salvaging Operations. Welding Of Metals: Welding processes; Metallurgical Processes occurring in welding. Types of Welding: Fusion welding processes; solid-phase welding processes; Electric ore welding, Oxy-acetylene Gas Welding; Electron Beam Welding; Resistance Welding; Electron Beam Welding; Resistance Welding; forge Welding; Friction Welding, Electroslag Welding. Metallurgy of Welding: The weld metal, Non-metallic inclusions; Gas priosity; The Heat-affected zone. Hard-zone cracking; The Heat – affected zone; Hard-zone cracking; structural steels. Quality control and Rejects in Welding: Deformation and stresses in welding; Welding Inspection.

MCE414 - Modeling and Simulation in Mechanical Engineering (2 Units)

Introduction to Modelling and Simulation, discrete, continuous and real-time events, engineering system, modeling, visualization, analysis. Practical hands-on proficiency in the use of engineering packages for analysis, design, Modeling and Simulation such as MATLAB, SIMUL8, MAPLE, etc.

MCE415 - Thermodynamics and Fluids Laboratory (1 Unit)

An introduction to thermo-fluid experimentation and measurement; basic flow phenomena demonstrated; measurement techniques for flow temperature, pressure and properties; report writing and data reduction methods, including statistical treatment of data; formal oral reports.

MCE416 - Fluid Power Systems (2 Units)

Review of flow through conduits and fittings (pipes, orifices, nozzles, diffusers, valves, bends, junctions). Analysis and design of pipe network, pipes in series, parallel and net work. Fluid power machinery and components, performance characteristics and selection criteria for pump, compressor, fans, motors, accumulators, valves, actuators. Fluid power circuits and control, (hydraulic, pneumatic)—open centre, float centre, closed centre, meter-in, meter-out, etc. Design of fluid power systems, load inertia, overrunning, resistive, compressibility. Power system fluids, survey of hydraulic fluids and their properties, the ideal hydraulic fluids and seals.

MCE417 - Foundry Practice and Metallurgical Laboratory (1 Unit)
Review of flow through conduits and fittings (pipes, orifices, nozzles, diffusers, valves, bends, junctions). Analysis and design of pipe network, pipes in series, parallel and net work. Fluid power machinery and components, performance characteristics and selection criteria for pump, compressor, fans, motors, accumulators, valves, actuators. Fluid power circuits and control, (hydraulic, pneumatic)—open centre, float centre, closed centre, meter-in, meter-out, etc. Design of fluid power systems, load inertia, overrunning, resistive, compressibility. Power system fluids, survey of hydraulic fluids and their properties, the ideal hydraulic fluids and seals

MCE418 - Applied Thermodynamics (2 Units)
Vapour power cycles: Rankine cycle, Binary vapour cycle, Cogeneration, Reheat and feedwater heaters; Gas power systems: Ideal Gas Cycles, Air standard Brayton cycle, Air craft engines, Otto, Diesel, Ericson and Stirling Cycles, combined gas turbine-vapour power cycle.

MCE419 - Metrology and Instrumentation (2 Units)
Basic principles of measurement of mass, linear and angular displacement, velocity, acceleration, force, torque. power, flow, pressure, temperature, strain and stress. Instrument selection, errors, and calibration. Theory and practice of high precision. Mechanical measurements under strict control conditions. Super micro-metry, comparator profilometry, collimators application in machine installations, etc. Tolerances and Fits: Clearance, transition and interference fits. Elements of instrument systems. Dynamic Performance. Primary sensors. Signal processing analog and digital recording. Reliability Engineering: Modern control for assuring quality, productivity and lower cost, statistical engineering techniques for process control and product acceptance are emphasized, recognized methods are also presented for

defects reductions, product liability prevention, inspection improvement, traceable calibration and tender/customer relations.

EIE412 - Control Systems (3 Units)

Introduction: definition, examples of control systems. Open-loop and closed-loop control systems. Review of Laplace and inverse Laplace transforms. System modeling: Signal flow graph, block diagram. Transfer function. Poles and zeros. Block diagram reduction using signal flow graph and block diagram reduction techniques. Mechanical, electrical and electromechanical systems. First and second order models, higher order models. Definitions of transient response parameters. Analysis of second-order system as prototype. Routh-Hurwitz stability criterion. Classification of systems based on steady-state characteristics, steady-state error coefficient. Definition of Root locus, Properties of root locus, sketching of root locus plots. Effect of open-loop zeros and poles. Root locus design concepts. Frequency response analysis and design: Bode diagram, Polar plot, Nichols plot. Nyquist stability criterion: non-mathematical description of Nyquist criterion, interpretation of stability. Relative stability - Gain and phase margins. Closed-loop frequency response analysis - M and N contours, Nichols chart. Compensation techniques: lag, lead and lag-lead compensation, PD, PI and PID controllers. Cascade compensation based on root-locus method. Introduction to Feedback compensation. Computer-aided design and analysis of control system.

Omega Semester

GEC429 - SIWES: Industrial Training (6 Units)

During the SIWES, each student will undergo practical on the job training in an engineering industry approved for its relevance to the student's major for a minimum of 28 weeks starting immediately after the first semester examinations at 400 level. A programme of training will be drawn by the College and the Industry for each student, and a prescribed log book with daily recording of the student's activities is to be kept by each student and appropriately signed. At the end of the programme, a written report is to be submitted to the college and each student to present a seminar on his/her industrial experience. Each student must pass a prescribed certification examination during the industrial training.

500 Level

Alpha Semester

MCE510 - Research Methodology (1 Unit)

Introduction: Definition of research, definition of development, reasons for research, difference between research and development. Literature survey. Research proposal writing. Data collection and analysis. Data mining. Presentation of technical information. Technical report writing. Intellectual property and patents. Turning research findings into useful products. Prototyping and copyright transfer. Generating theorems from research findings.

MCE513 - Fluid Machinery (3 Units)

Classification of fluid machines, theory of rotodynamics machines, one dimensional theorem, isolated and cascade considerations, departure from Euler's theory and losses. Compressible flow through rotodynamics machines. Performance characteristics, losses and efficiencies. Centrifugal pumps, and fans, axial flow pumps and fans. Water turbines. The Pelton wheel, Francis turbine. Axial flow turbines. The fluid coupling. The torque converter. Positive displacement machines. Reciprocating pumps. Rotary gear, vane and piston pumps. Hydraulic motors. Pipe machine system: pump and pipe system, parallel and series pump operation, cavitations in pumps and turbines, pump selections.

MCE515 - Machine Design II (3 Units)

Analysis and design of individual machine components: Gear Design, springs, Brakes, Clutches Couplings and Flywheels, Fasteners and Power Screws. Component Assemblies and Machine Systems.

MCE517 - Energy Management and Technology (3 Units)
Energy and Society. Sources of Energy. Energy demand and supply. Conventional and unconventional (renewable) energy. Energy conversion systems and devices for oil, gas, coal, heat, wood, nuclear, solar, wind, biomass, tidal, etc. Energy conservation. Energy Auditing. Nature and availability of wind energy; wind turbines, classification, construction and control; performance evaluation methods; power, efficiency, reliability and cost; load matching; nature and availability of solar radiation; radiation estimations and measuring instruments; materials for solar energy utilisation, radiative properties and thermal transport properties; introduction to non-concentrating collectors, design techniques and performance estimation; solar component and solar system operational characteristics; practical applications of solar energy, special solar devices for developing countries; and desalination, photovoltaics and solar water pumping.

MCE518 - Corrosion Science and Engineering (3 Units)
What is Corrosion? – Introduction/Definition. Why metals corrode. Chemistry and the electrochemistry of corrosion Electrochemical basis of corrosion: Introduction, electrochemical reaction, anodic processes; cathodic processes; combined anodic and cathodic processes, polarization. Forms of Corrosion: Uniform/general corrosion; galvanic attack; Localized Corrosion – Pitting Corrosion; Crevice Corrosion; Inter–granular corrosion/ selective leaching; erosion – corrosion; fretting corrosion; Environmental Fracture – stress – corrosion cracking; corrosion – fatigue; hydrogen embrittlement, embrittlement by liquid metals. Corrosion Prevention and Control: Materials selection alteration of environment: inhibitors, design rules, cathodic and anodic protection coatings – metallic and other inorganic coatings; electrodeposition, flame spraying; cladding; hot dipping; vapour deposition; diffusion, chemical conversion. Organic coatings. Economic considerations. Corrosion Monitoring Methods: Electrical and Electrochemical Methods–Resistance techniques; Linear polarization; electrical resistance; potential monitoring; zero–resistance ammeter; potentiostatic and potentiodynamic tests;

galvanostatic & galvano-dynamic test. Physical Methods: Acoustic emission; ultrasonics, hydrogen probes, analytical; test coupons, and Analysis of corrosion products; Modern Theory Principles: Thermodynamics. Free Energy; Cell Potentials and the EMF Series; Applications of thermodynamics to corrosion. Electrode Kinetics – exchange current density, Activation polarization; concentration polarization; combined polarization; passivity. Electrode Kinetics – exchange current density, Activation polarization; concentration polarization; combined polarization; passivity. Predicting Corrosion behaviour; Alloy evaluation. Corrosion – rate measurements. Tafel extrapolation; linear polarization; High Temperature Corrosion: The driving force, parabolic oxidation.

MCE519 - Project I (0 Unit)

Each student is required to undertake a project that gives productivity value to the academic knowledge gained in his\her field of study. The project shall involve problem solving using engineering theories and techniques, and the implementation of the project design. The student is expected to design a possible solution to the problem, taking into account various aspects such as professionalism, economy, costing, and engineering viability. At the end of the first semester, each student shall present a seminar on his/her project.

MCE552 - Thermodynamics IV: Thermal Power and Propulsive Systems (3 Units)

Thermodynamic properties of gases and vapors relating to power generating devices, work-energy relations, combustion and heat exchangers. Performance analyses and design concepts of gas turbines, internal combustion engines, steam power plants and heat exchanger equipment from theoretical and applied viewpoints.

MCE553 - Internal Combustion Engines (2 Units)

Introduction - Brief history of IC engines, basic engine operation, introduction to engine cycles, spark ignition engine cycles, diesel engine cycles, gas turbine engine cycles, and 2 Vs 4 stroke engines.

Thermodynamics of IC engines - Internal Vs external combustion engines, air standard cycles, fuel-air cycles, actual cycles, power, torque, thermal efficiency, mean effective pressure, and local effects of operating variables on actual cycles. Air capacity of IC engines - Volumetric efficiency, real power and torque Vs volumetric efficiency, idealized inlet and exhaust processes, real intake and exhaust processes, 2 stroke engine air capacity and scavenging. Fuel for IC engines - Volatility, detonation characteristics of fuels for spark ignition engines, octane ratings, energy values of fuels, heat of evaporation of fuels, fuels for diesels, alternative fuels and mixture requirement for S.I. engines. Combustion - Ideal combustion of S.I engines, real combustion of S.I engines, abnormal combustion of S.I engines, combustion Vs operating variables, diesel combustion, and combustion Vs engine design. Fuel System - Carburetors, direct fuel injection, constant flow fuel injection, continuous fuel injection and electronic fuel injection. Ignition Systems - Spark plugs, breaker point ignition, transistorized ignition, capacitive discharge ignition, magneto ignition, distributor less ignition and ignition timing. Emission control systems - Emission sources, exhaust after treatment, emission reduction systems and diesel emissions. Electronic engine controls - Open vs. closed loop control, sensors and actuators, adaptive controls, speed density fuel control, mass air fuel control, emission systems control and selected engine control and on board diagnostics. Engine Design - Cylinder arrangement, balancing, cylinder head design, pistons and rings, camshafts and valve trains, intake and exhaust systems. Performance and Testing - Dynamometer testing, supercharging, intake and exhaust system tuning, losses reduction and race engines.

MCE500 - Analytical Dynamics (3 Units)

General introduction; review of kinematics, particles kinematics, rigid body kinematics. Degree of freedom. Formulation of equations of motion for multi degree of freedom, Newton's laws, principle of virtual work, d' Alembert's principle, Lagrange's equations and Euler equations and triangles, Hamilton's principle, Hamilton's equations, Holonomic and Non-Holonomic constraints. Least action and Jacobi's principle. Central force motion and stability of equilibrium. Solution to equation of motion, gyroscopes.

MCE501 - Introduction to Robotics (3 Units)

This course provides an overview of robot mechanisms, dynamics, and intelligent controls. Topics include planar and spatial kinematics, and motion planning; mechanism design for manipulators and mobile robots, multi-rigid-body dynamics, 3D graphic simulation; control design, actuators, and sensors; wireless networking, task modeling, human-machine interface, and embedded software. Weekly laboratories provide experience with servo drives, real-time control, and embedded software. Students will design and fabricate working robotic systems in a group-based term project.

MCE502 - Production Engineering I (3 Units)

Introduction: The role of Production Engineering in the Mechanical Engineering Profession. Mechanics and Kinematics of Machine Tools. Tool Geometry and chip formation. Mechanics of cutting with single - point tools. Merchant's Analysis. Other theories Economics of Cutting; variables affecting metal removal rate, economic cutting speed. Cutting - tool materials, cutting fluids. Principles of Metal cutting with multi-point tools: milling, grinding, drilling, boring, etc. Time and cost Estimates.

MCE503 - Synthesis of Mechanisms (3 Units)

Vector and matrix methods in mechanisms. Freedom and constraints in mechanisms. Introduction to synthesis of mechanisms. Number synthesis. Dimensional synthesis and Rigid body guidance. Function and path generation. Computing mechanisms. Graphical, and Analytical methods.

MCE504 - Welding Engineering (3 Units)

Survey of welding processes: characteristics of welding processes, proper selection of welding materials, selection or welding variables. Welding metallurgy, metallurgy of ferrous and non-ferrous metals subjected to welding thermal cycle. Testing and evaluation of welded joints, destructive testing of welded joints, non-destructive inspection of welded joints. Evaluation of welding materials. Residual stresses and distortion causes. Measurements, design and· procedure for reducing residual stresses and distortion. Weldability of metals and alloys. Codes and standards.

MCE505 - Tribology (3 Units)
Structure and properties of solids; Structure of surfaces and interactions between surfaces; Contact between surfaces and adhesion; Friction and measurement of friction coefficients; Wear mechanisms and laws including adhesive, abrasive, erosive and corrosive wear; Lubrication including solid, fluid and boundary lubrication; Surface characterization and surface engineering; Tribological components and applications, including biomedical applications. Micro and Nanotribology and their relationship to macro behaviour; Designing tribological systems.

Omega Semester

MCE 521- Automotive Engineering (3 Units)
Mechanics of vehicles, vehicle components and design, Engine friction and lubrication systems, traction, gear system: manual and automatic, cooling systems, chassis and suspension, transmission systems, steering and front axle, braking systems, tyres, automotive electrical systems, Air-conditioning, maintenance and troubleshooting of automobiles.

MCE524 - Heat Transfer (2 Units)
Conduction: Fourier's Law, thermal conductivity, heat transfer through composite walls, multi-layer cylinders and spheres; insulation thickness, rectangular and triangular fuis, transient heat conduction, heat conduction in two dimensional plate, convection, convection mechanism, use of dimensional analysis, relation between film and overall heat transfer coefficients, forced convection over plates, rods and through tubes, free convection from vertical planes and cylinders, radiation; radiation properties, shape factors, geometric factors, radiation between non-black bodies, combined conduction, convection and radiation, types of heat exchangers and their applications; log means temperature difference, overall transfer coefficient, Solar radiation, introduction to mass transfer.

MCE525 - Engineering Vibrations (2 Units)
Vibration of machinery; Free and forced vibration of first and second degree systems, natural frequency response of linear mechanical systems, with and without damping. Lumped and distributed mass systems. Torsional vibrations. Transverse vibrations of beams. Resonance. Applications include isolation, stability, and balancing. Use of computational methods for simulation system response and the use of modal analysis for understanding the vibratory response of complex systems.

MCE526 - Machine Maintenance and Overhaul Technology (3 Units)
Definition of maintenance, purpose of maintenance and its types. Machine inspection, rate of wear and replacement time prediction. Planning and organization of service and maintenance workshops. Basic technologies and equipment for overhauling internal combustion engines, pumps and small output power generating plants, machine - tools, vehicles, earth-moving equipment and lifting devices. Special techniques in machine repairs. Planning of the spares stock and connected problems.

MCE527 - Introduction to Mechatronics (3 Units)
Definition and application of the synergy. Mechanical gear system, rack and pinion, worm and screw, and simple calculations. Electrical transformer as equivalent of mechanical gear. Analogue sensors: pressure, temperature, linear displacement, angular displacement, rate gyro, acceleration, light sensors, ir sensors, hall effect sensors. Motion detection. Digital sensors: heading sensor, gps, gsm, compass, digital infrared sensor, shaft encoder, and their interfacing. Actuators: DC motors, ac servo, stepper motor, ac motor, linear actuator, relays. Signal conditioning, introduction to adc and dac. Electronics and hardware components for mechatronics - Computer interfacing, hardware for digital/analog interfacing, devices for data conversion Advances applications - Topics may be chosen from the following: fuzzy logic control, adaptive control techniques and applications, intelligent supervisory control in process systems, condition monitoring methods and examples, performance evaluation and fault finding.

MCE528 - Production Engineering II (3 Units)
Specification and standardization for production: Interchangeable manufacture, preferred sizes, limits and fits, tolerance, economic aspects. Fundamentals of Measurement: length standards, sources of error, angular measurement, Comparators, autocollimator, indirect measurement, straightness and flatness testing. Surface finish. Fundamentals of Gauge Design. Screw Threads, specification tolerancing, Gauging and Measurement. Statistical methods of process control. Principle of planning and Tools Design. Industrial health and safety. Ergonomics.

MCE529 - Project II (6 Units)
The project work is to be completed in this second phase. Each student is to submit a proper written report (3bound copies, and a CD-ROM of electronic copy). The project is presented and defended at a seminar.

MCE540 - Industrial Engineering (3 Units)
Work study, payment systems, Job evaluation, production planning and control. Resources allocation, inventory control, ordering, motion study. Principles of accountancy. Standard costs including overhead determination. Budgetary control. Variance analysis. Company balance sheet. sources of finance. Ergonomic design of man-machine systems. Plant layout and design site selection. Concepts, techniques and application of operations research. Linear programming, queuing theory and Monte Carlo techniques.

MCE541- Engineering Economics (1 Unit)
Introduction to engineering economics, basic economic concepts, tools of economic analysis, demand, supply, production, cost and revenue functions; analysis of production and marketing; income and income tax, interest and depreciation; economic analysis of engineering projects; estimation of Capital and Manufacturing Costs; budgeting; evaluation of engineering alternatives; investment and risk analysis, elements of international trade.

MCE542 - Building Services (1 Unit)
Overview of Building Services, role of mechanical engineers and other professionals in building construction industry, cold and hot water supply system, heating systems, fuel characteristics and storage, ventilation systems, Air-conditioning, drainage systems, sewage treatment and refuse disposal, sanitary, fitments and appliances: discharge and waste systems, gas installation: components and controls, electrical supply and installations, mechanical conveyors – lifts, escalators and travelators, fire prevention and control services, security installations, accommodation for building services, relevant of alternative and renewable energy in building services/construction. Basic concept of preparation of bill of material/quantity, tendering, commissioning, reimbursement, valuation (stage by stage and final), certificate of completion, and related duties of mechanical consultancy and contracting in building services.

MCE543 - Work Design and Ergonomics (3 Units)
Productivity measurement and improvement. Principle of motion economy. Motion study techniques. Ergonomic considerations. Work place design. Time measurement techniques. Rating and allowances systems. Learning curves. Incentive plans.

MCE544 - Material Handling and Equipment (3 Units)
Classification. Performance characteristics. Economic choice. Design of hoisting equipment and components: (ropes, sheave systems, chains, rope drums). Design of transport equipment: (lorries, tracks, conveyors, shovels). Design of conveyor belts: (belts, buckets, screws, rolls).

3D Printer in one of the Mechanical Engineering Laboratories

CHAPTER SIX

SCHOOL OF CHEMICAL AND PETROLEUM ENGINEERING

6.0 DEPUTY DEANS' WELCOME MESSAGE

I am delighted to welcome you to the School of Chemical and Petroleum Engineering, Covenant University. The School was established in the College of Engineering to enhance and facilitate the coordination of the academic activities not only in the College of Engineering but also in the University. There are currently two Departments in the School, Chemical Engineering and Petroleum Engineering, which offer programmes both at the undergraduate and postgraduate levels.

Vision

The vision of the School of Chemical and Petroleum Engineering is in consonance with that of Covenant University to become one of the leading World-Class Universities. In pursuance of this vision, the School is committed to high quality teaching and research with a view to producing a new generation of leaders with the competence, confidence and knowledge base that will lead to the transformation of Nigeria and Africa and restore the dignity of the continent.

Mission

The mission of the School of Chemical and Petroleum Engineering is the relentless application of the best academic activities in training our students in the acquisition of the knowledge to develop our natural resources, especially oil and gas, for the alleviation of poverty in our country in pursuance of the our national Millennium Development Goals (MDGs).

Philosophy

The philosophy of the School of Chemical and Petroleum Engineering is based on engaging integrated training to produce competent and self-reliant graduates that will make meaningful contributions to the development of Nigeria and the rest of Africa in the utilization of our vast natural resources especially oil and gas.

Professor Ogbemi O. Omatete
Deputy Dean, School of Chemical and Petroleum Engineering

Covenant University Landscape

6.1 DEPARTMENT OF CHEMICAL ENGINEERING

OVERVIEW OF THE DEPARTMENT

The Department was founded in 2004 under the College of Science of Technology and has grown rapidly since then. The academic staff includes three Professors and Lecturers with extensive industrial experience.

Vision

The Department aspires to world-class status in the nearest future, with its products well versed not only in the theoretical principles but also in the practical applications of the discipline.

Mission

The Chemical Engineering Programme is designed to train graduates who will be producers rather than mere consumers. The Programme emphasizes not only the processing of materials but also the optimal utilization of locally available raw materials for the production of goods for local consumption and exports. This is in support of a major target of the Millennium Development Goals which aim at reducing by half the proportion of people living on less than $1 a day, and those suffering from hunger by the year 2015. For this purpose, the nation must have a very vibrant industrial sector that will provide gainful employment for the citizens as well as the goods and services that modern societies thrive on. It is expected that the Chemical Engineers from the Department will play a major role in realizing this goal. Thus, the Programme is designed to contribute to all the ten industrial sectors, namely:

i. Wood and Wood Products;
ii. Pulp, Paper and Paper products, Printing and Publishing;
iii. Domestic and Industrial Rubber, Plastic and Foam;
iv. Non-Metallic Mineral Products;
v. Textile, Wearing Apparel, Leather and Leather Products;
vi. Chemicals and Pharmaceuticals;
vii. Motor Vehicles and Miscellaneous;

viii. Food Beverages and Tobacco;
ix. Base Metals, Iron and Steel, and Engineering Services; and
x. Electrical and Electronics.

The course contents address subjects in pesticides which are critical for the agricultural (food production) Programme emphasized in Vision 2020 as well as the Millennium Development Goals. Similarly, foundation technologies for drug manufacturing are taught in the biochemical engineering module of the Programme.

Philosophy

Nigeria is becoming an industrialized nation. Many industries are either oil-based or gas-based. Though the chemical and food industry is still in its infancy in Nigeria, especially in the area of local content, a number of industries are springing up utilizing the various agro and mineral raw materials available in the country. Internationally, there is a projection of a dearth of qualified chemical engineers in the next decade. The Chemical Engineering Programme in Covenant University aims at training qualified engineers that can operate and manage industries in Nigeria and fill the international vacuum in the very near future. The training is to produce graduates, who will be producers of goods and services, and who, upon graduation, will be functional engineers in industries, researchers, scholars in the academia, or successful entrepreneurs in Chemical Engineering-propelled ventures. The training is designed to place the graduates on the leading edge of technology.

Objectives

i. To put in place curricula that cover broad and dynamic engineering principles, working knowledge of entrepreneurial, marketing and management principles.
ii. To empower our students with necessary skills to create value and bring the solutions needed to tackle challenges in the chemical and allied industries.

iii. To make our graduates foremost chemical engineers both in the country and internationally through well-designed competency-based training programmes of teaching and research.
iv. To facilitate the acquisition of practical work experience in the industries.
v. To inculcate discipline in research and development to chemical engineering graduates.

LIST OF ACADEMIC STAFF IN THE DEPARTMENT

S/N	NAME	QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	Prof. J.A. Omoleye	B.Sc, M.Sc, Ph.D, MNAI, COREN	Professor/ HOD	Reaction Engineering, Catalysis, Energy.
2.	Prof. O. O. Omatete	BSE, MSE, MPA, Ph.D FNSChE, FNAE, MAIChE, MACeRS, COREN	Professor	Separation Processes
3.	Prof. J. O. Odigure	B.Sc, M.Sc, Ph.D, COREN, MNSE	Professor	Chemical Technology
4.	Mr. J. S. Udohitinah	M.Sc, Postgraduate Cert. in Paper Technology, MNSChE	Lecturer I	Pulp and Paper
5.	Dr. V. E. Efeovbokhan	B.Tech, M.Eng, Ph.D, R. Engineer, COREN, MNSE, MNSCh.E	Lecturer I	Chemical Reaction Engineering
6.	Engr. A. A. Ayoola	B.Tech, M.Sc	Lecturer I	Separation Processes
7.	Dr. A. O. Ayeni	B.Tech, M.Sc, Ph.D, MNSE	Lecturer II	Biochemical, Bioenergy Processes, Renewable Energy
8.	Engr. O. A. Adeeyo	B.Tech, M.Sc, COREN	Lecturer II	Electrostatic Separation
9.	Mrs M. E. Ojewumi	B.Tech, M.Sc, MNSE, COREN	Lecturer II	Biochemical Engineering
10.	Mrs T. E. Oladimeji	B. Tech, M.Sc	Assistant Lecturer	Environmental Engineering
11.	Mr. S. E. Sanni	B. Tech, M.Sc	Assistant Lecturer	Modelling of Process Engineering Systems, Reaction Kinetics, Transport Phenomena
12.	Mrs. O. G. Abatan	B.Eng, M.Eng.	Assistant Lecturer	Catalysis & Chemical Reaction Engineering
13.	Miss O. A. Oresegun	B.Sc, M.Sc.	Assistant Lecturer	Polymer Engineering/ Technology

VISITING LECTURERS

S/N	NAME	QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	Dr. O. A. Olafadehan	B.Sc (ChE), M.Sc (ChE), Ph.D (ChE), MNSChE, MNSE, MACS, R. Engr. (COREN)	Associate Professor	Chemical Reaction Kinetics and Engineering; Modeling & Simulation
2.	Dr. J.O. Udonne	B.Sc. (ChE), M.Sc (ChE), Ph.D (ChE), MNSChE, MNSE, (COREN)	Senior Lecturer	Polymer Engineering
3.	Dr. D. B. Ayo	B.Sc (ChE), M.Sc (ChE), Ph.D (ChE), FNSChE, FNSE, (COREN), MNIM	Senior Lecturer	Reaction Engineering, Catalysis
4.	Dr. O. A. Ajayi	B.Sc (ChE), M.Sc (ChE), Ph.D (ChE), MNSChE, MNSE, MACS, R. Engr. (COREN)	Senior Lecturer	Reaction Engineering, Process Modeling, Simulation, Dynamic and Control

TECHNICAL STAFF

S/N	NAME	QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	O. J. Omodara	OND, HND, B.Eng	Technologist II	Chemical Engineering
2.	E. A. Oyeniyi	B. Tech	Technologist II	Chemical Engineering
3.	B. S. Omote	OND	Laboratory Assistant	Assisting the Lab. Technologists
4.	J. N. Ehoda	SSCE	Laboratory Attendant	Supports the Lab. Technologists

ADMINISTRATIVE STAFF

S/N	NAME	QUALIFICATION	STATUS
1.	Mrs. S. O. Ogunniyi	OND, HND Business Admin	Admin. Officer

Rising Film Evaporator at the Chemical Engineering Department

6.1.1 CHEMICAL ENGINEERING PROGRAMME

PROGRAMME: Chemical Engineering

DEGREE AWARDED: B.Eng (Honours) Chemical Engineering

DURATION: Five (5) Years (10 Semesters)

ADMISSION REQUIREMENTS

The minimum entry requirements for admission into the Chemical Engineering Programme are: O' level SSCE/GCE/NECO Credit level pass in five (5) subjects, including English, Mathematics, Physics, Chemistry, and either credit pass in Further Mathematics, Biology, or Technical Drawing. In addition, the Covenant University conducts screening exercises for all candidates seeking admission into the University.

GRADUATION REQUIREMENTS

To graduate from the 5-year Bachelor of Engineering (B.Eng.) Degree Programme in Chemical Engineering, students must have successfully completed a total number of 210 credit units as shown below:

Required Units for Graduation for B.Eng. Chemical Engineering Programme

Level	100	200	300	400	500	Total
NUC Courses	10	6	2	-	-	18
University Courses	4	4	4	2	4	18
Compulsory Courses	31	38	40	23	30	162
SIWES	-	-	-	6	-	6
Electives	-	-	-	-	6	6
Total	**45**	**48**	**46**	**31**	**40**	**210**

COURSE STRUCTURE

100 Level Chemical Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	GEC117	Technical Drawing	C	2		α
	MAT111	Mathematics I: Algebra	C	3		α
	MAT112	Mathematics II: Trigonometry and Geometry	C	2		α
	PHY111	Mechanics and Properties of Matter	C	2		α
	PHY112	Heat, Sound and Optics	C	2		α
	PHY119	Physics Practical IA	C	1		α
	CHM111	General Physical Chemistry	C	3		α
	CHM119	General Chemistry Practical I	C	1		α
	MAT121	Mathematics V: Calculus	C	3		Ω
	MAT122	Mathematics VI: Vector Algebra	C	2		Ω
	PHY121	Electricity and Magnetism I	C	2		Ω
	PHY122	Atomic and Nuclear Physics	C	2		Ω
	PHY129	Physics Practicals IIB	C	1		Ω
	CHM121	General Organic Chemistry	C	2		Ω
	CHM122	General Inorganic Chemistry	C	2		Ω
	CHM129	General Chemistry Practical II	C	1		Ω
University Courses	EDS111	Entrepreneurial Development Studies I	V	1		α
	TMC111	Total Man Concept I	V	1		α
	TMC112	Total Man Concept - Sports	V	0		α
	EDS121	Entrepreneurial Development Studies II	V	1		Ω
	TMC121	Total Man Concept II	V	1		Ω
	TMC122	Total Man Concept – Sports	V	0		Ω
NUC General Courses	CST111	Use of Library, Study Skills and Information Communication Technology I	U	2		α
	GST111	Communication in English I	U	2		α
	CST121	Use of Library, Study Skills and Information Communication Technology II	U	2	CST111	Ω
	GST121	Communication in English II	U	2	GST111	Ω
	GST122	Communication in French	U	2		Ω
			α =22 Ω = 23 Total = 45 Units			

200 Level Chemical Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	GEC210	Engineering Mathematics I	C	2	MAT122 MAT123	α
	GEC211	Introduction to Electrical Engineering I	C	2		α
	GEC212	Engineering Graphics	C	2		α
	GEC214	Applied Mechanics	C	3		α
	GEC215	Applied Computer Programming I	C	2	CST121	α
	GEC216	General Engineering Laboratory I	C	3		α
	GEC217	Engineer-In-Society	C	1		α
	GEC218	Workshop Technology	C	2		α
	CHE211	Introduction to Chemical Engineering	C	2		α
	CHE212	Selected Topics in Chemistry for Non-Majors 1	C	2		α
	GEC220	Engineering Mathematics II	C	2		Ω
	GEC221	Thermodynamics	C	2		Ω
	GEC223	Fluid Mechanics	C	2		Ω
	GEC224	Strength of Materials	C	2		Ω
	GEC225	Applied Computer Programming II	C	2		Ω
	GEC226	General Engineering Laboratory II	C	3		Ω
	GEC228	Introduction to Electrical Engineering II	C	2		Ω
	CHE222	Selected Topics in Chemistry for Non-Majors 11	C	2		Ω
SWEP	GEC229*	Student Workshop Experience Programme (SWEP)	S	0		Ω
University Courses	EDS211	Entrepreneurial Development Studies III	V	1		α
	TMC211	Total Man Concept III	V	1		α
	TMC212	Total Man Concept - Sports	V	0		α
	EDS221	Entrepreneurial Development Studies IV	V	1		Ω
	TMC221	Total Man Concept IV	V	1		Ω
	TMC222	Total Man Concept – Sports	V	0		Ω
NUC General Courses	GST211	Logic, Philosophy and Human Existence	U	2		α
	GST221	Nigerian People and Culture	U	2		Ω
	GST222	Peace Studies and Conflict Resolution	U	2		Ω
			α =25 Ω = 23 Total = 48 Units			

__NOTE__: GEC229 (SWEP) is taken during the long vacation

300 Level Chemical Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	CHE310	Chemical Engineering Process Analysis I	C	3	GEC210 GEC220	α
	CHE312	Chemical Engineering Laboratory I	C	2		α
	CHE313	Transport Phenomena I	C	3	GEC223	α
	CHE317	Computer Packages for Chemical Engineers	C	3		α
	GEC310	Engineering Mathematics III	C	3	GEC220 GEC210	α
	CHE319	Technology Management	C	3	GEC224	α
	ECN211	Principles of Economics I (Micro)	C	2		α
	CHE320	Chemical Engineering Process Analysis II	C	3	CHE310	Ω
	CHE321	Unit Operations I	C	3		Ω
	CHE322	Chemical Engineering Laboratory II	C	2	CHE312	Ω
	CHE323	Transport Phenomena II	C	3	CHE313	Ω
	CHE325	Chemical Engineering Thermodynamics I	C	3	GEC310 GEC220	Ω
	GEC321	Engineer-in-Society II	C	1		Ω
	CHE326	Chemical Reaction Engineering I	C	3		Ω
	GEC320	Numerical Methods	C	2	GEC310	Ω
	GEC324	Technical Communication	C	1		Ω
University Courses	EDS311	Entrepreneurial Development Studies V	V	1		α
	TMC311	Total Man Concept V	V	1		α
	TMC312	Total Man Concept – Sports	V	0		α
	EDS321	Entrepreneurial Development Studies VI	V	1		Ω
	TMC321	Total Man Concept VI	V	1		Ω
	TMC322	Total Man Concept – Sports	V	0		Ω
NUC General Course	GST311	History and Philosophy of Science	U	2		α
			α =23 Ω = 23 Total = 46 Units			

400 Level Chemical Engineering						
Course Grouping	**Course Code**	**Course Title**	**Status**	**Units**	**Pre-requisite**	**Semester**
Compulsory Courses	CHE410	Chemical Engineering Process Analysis III	C	3	CHE320	α
	CHE411	Unit Operation II	C	3		α
	CHE412	Chemical Engineering Laboratory III	C	2	CHE322	α
	CHE413	Transport Phenomena III	C	3	CHE323	α
	CHE414	Principles of Plant Design I	C	3		α
	CHE415	Chemical Engineering Thermodynamics II	C	2	CHE325	α
	CHE416	Chemical Reaction Engineering II	C	3	CHE326	α
	GEC410	Probability and Statistics	C	2		α
	CHE431	Corrosion of Metals and Alloys	C	2		α
SIWES [Industrial Training]	GEC429*	Student Industrial Work Experience Scheme (SIWES) [Industrial Training]	S	6		Ω
University Courses	EDS411	Entrepreneurial Development Studies VII	V	1		α
	TMC411	Total Man Concept VII	V	1		α
	TMC412	Total Man Concept - Sports	V	0		α
			α =25 Ω = 6 Total = 31 Units			

*400 Level Students are on Industrial Training during the Omega Semester

Students in Chemical Engineering Laboratory during a practical session

500 Level Chemical Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	CHE511	Biochemical Engineering	C	3		α
	CHE512	Process Dynamics and Control	C	3		α
	CHE513	Chemical Engineering Process Design I	C	3		α
	CHE516	Chemical Reaction Engineering III	C	3	CHE416	α
	CHE519	Research Project I	C	0		α
	CHE521	Industrial Chemical Operations and Management	C	3		Ω
	CHE522	Process Optimization	C	3		Ω
	CHE523	Chemical Engineering Process Design II	C	3	CHE513	Ω
	CHE524	Principles of Plant Design II	C	3	CHE414	Ω
	CHE529	Research Project II	C	6		Ω
Electives	***Note:*** *Select **3 Credit Units** from these Electives*					
	CHE517	Industrial Hazard and Environmental Pollution	E	3		α
	CHE518	Introduction to Polymer Engineering and Processing	E	3		α
	CHE510	Pulp and Paper Technology	E	3		α
	CHE527	Sugar Technology	E	3		Ω
	CHE528	Petroleum Refinery Engineering and Petrochemical Technology	E	3		Ω
	CHE520	Inventions and Patents	E	3		Ω
	CHE526	Pinch Technology	E	3		Ω
University Courses	EDS511	Entrepreneurial Development Studies IX	V	1		α
	TMC511	Total Man Concept IX	V	1		α
	TMC512	Total Man Concept - Sports	V	0		α
	EDS521	Entrepreneurial Development Studies X	V	1		Ω
	TMC521	Total Man Concept X	V	1		Ω
	TMC522	Total Man Concept-Sports	V	0		Ω

			α =17 Ω = 23 Total = 40 Units

COURSE DESCRIPTION

100 Level

Alpha Semester

GEC117 - Technical Drawing I (2 Units)
Drawing Tools: Description, Uses and Maintenance, Line Work: Definition of points, lines and planes, Types of lines (Description, Uses), Dimensioning: Examples like arrow heads, solid dots and crosses; of straight lines, of circles, inadequate space dimensioning, Common Errors in line drawings, Lettering, Drawing Sheets Format, Border Lines and Title Block. Plane Geometry: Angles (Types and their construction), Triangles (Types and their construction), Quadrilaterals (Types and their construction), Polygons (Types and their construction), Circle and It's Parts, Inscribing and Circumscribing Circles, Tangents (Internal and External), Ellipse (Different Methods of construction), Plane and Diagonal Scales. Orthographic Projection: Basic Introduction: Description, Plan, Elevations, 1st Angle Projection, 3rd Angle Projection, Sectioning, Exercises.

MAT111 - Mathematics I: Algebra (3 Units)
Algebra of set theory: Definition of concepts, laws of algebra of sets, Venn diagram and application. Real Numbers: Rational numbers, theory of surds, sequences and series (including AGP), binomial theorem, theory of quadratic, cubic and quartic equations, indices and logarithms, mathematical induction, partial fractions, theory of equations, inequalities and polynomials (including factor and remainder theorems). Complex Numbers: Algebra of complex numbers, Argand diagram, multiplication and division of numbers in polar form, nth root of unity, and DeMoivre's theorem, expansion of sin nØ, cos nØ, tan nØ.

MAT112 - Mathematics II: Trigonometry and Geometry (2 Units)
Trigonometry and analytic geometry in (2-D & 3-D): Elements of trigonometry, circular measure, elementary treatment of circles, coordinate geometry: straight lines in (2B-D); plans. Functions and relations: permutation and algebra of functions, Binary operations, Permutations and combinations, elementary treatment of logic.

PHY111 - Mechanics and Properties of Matter (2 Units)
Units and dimensions, scalars and vectors, particle kinematics, Newton's laws, friction, work, energy, centre of mass, simple harmonic motion, rigid body dynamics, kepler's laws, pressure in fluids, intermolecular forces, Hooke's law, Young's modulus, fluid flow streamline turbulence, stroke's law, surface tension.

PHY112 - Heat, Sound and Optics (2 Units)
Temperature, thermometers, heat transfer, PVT –surfaces, Kinetic theory, first and second laws of thermodynamic, transverse and longitudinal waves, standing waves, intensity, beats. Doppler Effect, Electromagnetic spectrum. Huygen's principle, images formed by a single surface thin lenses, aberrations, the eye, optical instruments, interface, single slit, diffraction grating, polarization, Malus' law.

PHY119 - Physics Practical I (1 Unit)
A selection from the following experiments use of measuring instruments, viscosity, surface tension oscillations about an equilibrium position, Hooke's law, moment of inertia, focal lengths of lenses, refractive index, optical instruments, the sonometer heat capacity, volume expansion and latent heat.

CHM111 - General Physical Chemistry (3 Units)
Historical development of the atom: atoms, Dalton's atomic theory, atomic masses. Fundamental particles of the atom atomic structure. Modern electronic theory, of atoms. Periodicity of the elements. Stoichiometry, mole concept, chemical formulas, equations and

calculations. State of matter; gas, liquid and solid. Chemical energetics Chemical kinetics, equilibria and electrochemistry.

CHM119 - General Chemistry Practical (1 Unit)
Quantitative inorganic and organic analysis for elements in Groups I, II, IIIA, IIIB, IV. Chemical analysis for functional groups: acidic, kenotic carboxylic, etc.

Omega Semester

PHY121 - Electricity and Magnetism I (2 Units)
Coulomb's law, Ohm's law, Gauss' Law, capacitors, Ohm's law, Kirchoff's laws, Electrical energy, DC bridges, potentiometer, magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometers, multi-meters, DC and AC motors and generators, hysteresis, power in AC circuits, semiconductors, conductivity and mobility, rectification.

PHY122 - Atomic and Nuclear Physics (2 Units)
Theory of atomic structure., Thompson, Rutherford and Bohr's theories, the hydrogen atom, properties of the electron, e/m, CRO, Millikan's experiment, properties of the nucleus, natural radioactivity, wave particle duality of light, x-rays, photo electricity, thermionic emission, diode valve.

PHY129 - Physics Practical II (1 Unit)
A selection from the following experiments, potential difference and internal resistance of cells, uses of potentiometer circuit, the meter bridge, simple direct current measuring instruments, Planck's constant, radioactivity.

MAT121 - Mathematics V: Calculus (3 Units)
Functions of Real Variables: Graph, Limits and Concepts of Continuity. Techniques of Differentiation of Algebraic and Trigonometric Functions, Higher Order Derivates, Maxima and Minima, Leibnitz Rule ,

Application of Differentiation. Integration as Inverse of Differentiation, Methods of Integration, Definite Integral. Application to Areas, Volumes, Moment of Inertia. Approximate Integration: Trapezoidal and Simpson's Rule. Taylor's and Mcclaurin's Theorems, partial Differentiation and Implicit Differentiation.

MAT122 - Mathematics VI: Vector Algebra (2 Units)
3-Dimensional Cartesian Coordinate Systems. Definition and Representation of Vectors, Algebra of Vectors, Multiplication of a Vector by a Scalar, Addition of Vectors, Scalar Products of two Vectors, Direction Cosines, Calculus of Vector Functions, Differentiation of Vector Function, Integration of Vector Function. Conic: Circles, Parabola, Ellipse and Hyperbola.

CHM121 - General Organic Chemistry (2 Units)
Historical survey of the development and importance of organic chemistry. Nomenclature and classes of organic compounds. Homologous series, functional groups, isolation and purification of organic compounds. Qualitative and quantitative organic chemistry, stereochemistry, determination of structure of organic compounds. Electron theory in organic chemistry; saturated hydrocarbons, unsaturated hydrocarbons.

CHM122 - General Inorganic Chemistry (2 Units)
Periodic table and periodic properties, chemical bonding, structures of solids. The chemistry of selected representative elements. Quantitative analysis, hybridization.

CHM129 - General Chemistry Practical II (1 Unit)
Qualitative inorganic and organic analysis for elements in Groups I, II, IIIA, IIIB, IV. Chemical analysis for functional groups: acidic, kenotic, carboxylic, etc.

200 Level

Alpha Semester

CHE211 - Introduction to Chemical Engineering (2 Units)
Chemical engineering functions, bench scale to industrial scale; Units and dimensions; temperature; pressure; the chemical equation and stoichiometry;
(limiting reactants, excess reactants, degree of completion); material balances. The gas laws (Charles, Boyle, Gay-Lussac, Dalton and Amagat, real gas relationships); vapour-liquid equilibrium (Raoult's law, relative and percentage saturation, condensation, due point); steam (enthalpy-temperature chart, steam tables, throttling, calorimetry). Combustion calculations (solid-liquid and gaseous fuels, excess air); industrial safety (hazardous chemicals, safety precautions).

GEC210 - Engineering Mathematics I (2 Units)
Functions, inverse trigonometric functions and principal values, hyperbolic & its inverse, graphs. Concepts of continuity and differentiability. Mean-value theorem. Taylor's series expansion. Integration by parts. Sequences: real numbers, monotone, convergence, limits. Infinite series: convergence tests, addition, multiplication. Power series, radius of convergence, integration, differentiation. Real and imaginary parts, the complex plane, terminology and notation. Complex algebra, DeMoivre's theorem, powers and roots of complex numbers. Euler formula. Elementary functions of a complex variable, polynomials, rational, exponential, trigonometric, hyperbolic, logarithmic, inverse trigonometric and inverse hyperbolic functions. Vectors in space, addition and scalar multiplication, linear combination of vectors, idea of linear dependence and independence. Dot and cross products, triple products, lines and planes.

GEC211 - Introduction to Electrical Engineering I (2 Units)
Fundamentals of electric, electromagnetic and electrostatic circuits. Transients in RC and RL dc circuits Steady-state dc circuit analysis:

Source conversion, Kirchoff's laws, Mesh analysis, nodal analysis, Thevenin and Norton theorems, superposition principle, star-delta transformation, Maximum power transfer. Steady-state ac circuit analysis: Phasors and phasor diagrams, Power triangle, power factor and power factor improvement, frequency response of RLC circuits, resonance. Introduction to simple diode and transistor circuits and characteristics: Amplification & rectification. Introduction to digital systems.

GEC212 - Engineering Graphics (2 Units)
Lettering, linework, dimensioning, orthographic projection, sectioning, isometric and oblique pictorial views. Graphical calculus, Architectural Drawing, electrical and communication, and IT symbols and drawing.

CHE212 - Selected Topics in Chemistry for Non-majors 1 (2 Units)
Qualitative treatment of Molecular Orbital and Valence Bond theories. Groups 1A and 11A, boron and aluminium, carbon and silicon, nitrogen and phosphorus, oxygen and sulphur and the halogens. Chemistry of noble gases. Introduction to the Chemistry of transition elements. Kinetic theory of gases. Molecular velocities and their distribution. Second law of thermodynamics. Entropy and free energy. Principles and applications of free energy concepts in determining spontaneity of reaction.

GEC214 - Applied Mechanics (3 Units)
Forces, moments, couples. Equilibrium of simple structures. First and second moments of area; centroids. Kinematics of rigid bodies in plane motion. Applications of Newton's laws of motion. Kinectic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature. The stress circle, deflection, deflection of beams. Shear forces and bending moments, analytical and graphical methods for structures. Design and analysis of communication towers, standards, and regulations.

GEC215 - Applied Computer Programming I (2 Units)
Software development life cycle (SDLC): Definitions, SDLC models: Waterfall model, V-shaped model, Incremental Model, Spiral Model.

Program Design: Algorithms: Key features of algorithms and different ways of presenting algorithms. Flow charting of algorithms. Pseudocode: Pseudocode statements for Input, Output, Iteration, Decision, and processing, Arithmetic, Relational and Logical Operations in Pseudocodes, use of sub-process in Pseudocode. Introduction to QBASIC Programming: Symbols, Keywords, Identifiers, Data Types, Operators, Control Structure, Functions, Procedures. Arrays: 1-D and Multidimensional Arrays. File handling: Concept of files, files and streams, standard file handling functions binary files, random access files.

GEC216 - General Engineering Laboratory I (3 Units)
Laboratory investigations and report submission on selected experiments and projects drawn from introduction to Electrical Engineering, Materials Science, Applied Mechanics, Applied Computer Programming I and Workshop Technology Courses.

GEC217 - Engineer-In-Society (1 Unit)
Science, Technology and Development: Ethical concepts of development. Indicators of development, and the role of science and technology. The contribution of the Government to the process of development and the Nigerian experience in the process of economic development (Nigerian Five Year Development Plans, successes and setbacks). Limits of growth, appropriate technology and a new world of science and technology. Science, Technology and Society: The inter-relationship of social ethics and values, and science and technology. Societal needs and resources in the genesis and development of science and technology. Social problems, impact assessment, and control of science and technology. Responsibilities of engineers. Science, Technology and Environment: Disruption or enhancement of environmental quality through harmful or sound science and technology in relation to air, space, water, land, populations, agriculture, industry, wild life, human settlements, culture, education, etc. Ethics and Professionalism: Theistic and secular concepts of personal, social and professional ethics. Codes of conduct of engineers. Motivation, control, responsibility, rewards and accountability of engineers and development

of an ethical engineering professionalism. Council of Engineers and Engineering Societies.

GEC218 - Workshop Technology (2 Units)
Introduction to engineering workshop practice covering mechanical, electrical, information engineering, civil, chemical, and petroleum engineering. Use of hand tools, and safety measures in these fields.

Omega Semester

GEC220 - Engineering Mathematics II (2 Units)
Partial Differentiation: Functions of several variables, continuity and partial derivatives. Total differentials, approximate calculations using differentials. Chain rule. Implicit differentiation. Series representation of functions, Taylor's Theorem. Extremum problems, without and with constraints, Lagrange multipliers, global extremum. Ordinary Differential Equations: Definition, degree, order, linear, non-linear, solution. First order equations, separable variables, equations reducible to separable form, exact equations, integrating factors, linear equations. Linear differential equations with constant coefficients, homogeneous, non-homogeneous, complementary functions, particular integrals, D-operator method. General linear second-order differential equations (without using matrices).Power series solution, Legendre's differential equation.

GEC221 - Thermodynamics (2 Units)
Basic concepts, quantitative relations of zeroth, first, second and third laws of thermodynamics. Behaviour of pure substances and perfect gases. Ideal gas cycles.

GEC223 - Fluid Mechanics (2 Units)
Properties of fluids. Fluid statics. Density, pressure, surface tension, viscosity, compressibility, etc. Basic conservation laws, friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional

analysis and dynamics similitude, principles of construction and operation of selected hydraulic machinery. Hydropower systems.

GEC224 - Strength of Materials (2 Units)
Forces, moments. Equilibrium of simple structures and machine parts. Kinematics of particles and rigid bodies. Newton's laws. Kinetic energy and momentum analysis. Hookes's law, stresses and strains due to loading and temperature changes. Stress circle. Deflection of beams. Shear forces and bending moments. Analytical and graphical methods for structures.

GEC225 - Applied Computer Programming II (2 Units)
Review of QBASIC and Introduction of Visual BASIC, Comparison of QBASIC and VBASIC. Creating applications. VBASIC Integrated Development Environment. Menu Design, Use of Procedures, Functions, Subroutines, and Event Procedures. Opening and Saving Pictures to folders. Writing to and Reading from files e.g. Notepad, Ms Word. Writing to and Reading from Database e.g. Access. Writing to and Reading from Text and database over the NET., Printing. Multimedia with VB: Sound, Music, and Video, Animation with VB. Calling other Applications from VB (Shell execute), html, pdf, doc, files

GEC226 – General Engineering Laboratory II (3 Units)
Laboratory investigations and report submission on selected experiments and projects drawn from introduction to electrical Engineering, Materials science, Applied Mechanics, Applied computer Programming I, and Workshop Technology courses.

CHE222 - Selected Topics in Chemistry for Non-majors II (2 Units)
Basic organic reactions e.g. addition, free radical, elimination and condensation reactions etc. Some named organic reactions. Stereochemistry, energy of activation and free radical substitution reactions in alkanes. Electrophilic and nucleophilic substitution reactions, Aromaticity. Theory of errors, Statistical treatment of data,. Theory of sampling. Chemical methods of analysis including volumetric, gravimetric

and physicochemical methods, optical methods of analysis. Introduction to separation methods of analysis.

GEC228 - Introduction to Electrical Engineering II (2 Units)
Analysis of Magnetic circuits, Hysteresis and eddy currents, three phase circuits, three-phase power measurement, Transformer theory; short-circuit and open-circuit tests, voltage regulation, efficiency. Electrical machines; constructional features and operation of dc generators and motors; single-phase and 3-phase motors and generators, electric energy utilization for lighting and heating. Tarrifs.

GEC229 - Student Work Experience Programme (SWEP) (0 Unit)
Introduction to practices and skills through supervised hands-on workshop exercises in computer engineering and information & communication technology, and related general engineering. These exercises include familiarisation with basic tools, soldering and desoldering skill of pass-through & surface mount components, building of simple electronic circuits, troubleshooting of electronic devices, digital systems, etc. Use of hand drill. Safety precautions in handling.

300 Level

Alpha Semester

CHE310 - Chemical Engineering Process Analysis I (3 Units)
Introduction to Chemical Engineering Unit Operations and auxiliary facilities. The basic equation of process industries. The principles of conservation of energy and matter applied to Industrial Processes. Chemical Engineering Process flow charts and process symbols.

CHE312 - Chemical Engineering Laboratory I (2 Units)
Laboratory session will be based on the courses to be taught during the session- these include: Distribution, Coefficient, cooling tower, Sedimentation, Fluid flow in packed columns, Flow Measuring Apparatus

etc. All laboratory courses are compulsory. Overall grade will consist of 2 parts: (a) written exam at end of laboratory session 25% (b) laboratory report grading (75%). Any student absent from laboratory session with official permission will have to perform the session at suitable date. Average score of reports on all laboratory sessions.

CHE313 - Transport Phenomena I (3 Units)
Units and dimensions. Properties of fluid momentum and energy equations. Vortex motion in liquids. Friction. Types of flow. Flow in open channels. Dimensional Analysis. Flow measurement devices. Pumps, Compressors, Valves and Piping.

GEC310 - Engineering Mathematics III (3 Units)
Matrices and Determinants:Matrices, some special matrices, matrix operations. Determinants and some useful theorems. Laplace's development. Solution of system of linear equations by determinants. Linear dependence and independence, rank of a matrix. General system of linear equations, existence and properties of solution, Gaussian elimination. Matrix inverse by elementary matrices, adjoint, and partitioning methods. Characteristic polynomial, characteristic equation, eigenvalues and eigenvectors. Diagonalization of matrices, application to system of first order linear differential equations. Multiple Integrals:Iterated integrals, multiple integrals over elementary regions. Change of variables, Jacobians. Differentiation of integrals involving a parameter, Leibniz's rule. Vector Algebra: Vector field, gradient and directional derivative, divergence, curl. Line and surface integrals, Stoke's theorem. Volume integrals, divergence theorem. Orthogonal transformations, scale factors, basis vectors. Cylindrical and spherical polar coordinate systems, gradient, divergence and curl in these systems. Fourier Series: periodic functions, trigonometric series. Fourier coefficients, Parsevals theorem, Functions of arbitrary period, even and odd functions. Half range expansion. Complex form of Fourier series. Integral Transform:Derivation of transforms and inverses (Fourier and Laplace). Applications of these transforms in boundary and initial value problems. Z transforms. Partial Differential Equations: Elementary

properties of Gamma, Beta, Error, Bessel functions and Legendre polynomials. Basic concepts of partial differential equations. Classification of 2nd order linear partial differential equation into basic types. The principle of superposition. The wave, diffusion and Poisson's equations. Boundary and initial-value problems. D'Alembert's solution for wave equation. Method of separation of variables. Biharmonic equation.

CHE317 - Computer Packages for Chemical Engineers (3 Units)
Introduction to MATLAB; Use of MATLAB to solve basic and advance mathematics problems; Resolving vectors and matrices; Plotting functions; MATLAB Script and Function files; Simulation of Dynamic Systems in MATLAB; Spreadsheets for Chemical Engineers; Plotting Functions in Excel; Thermodynamics, Mass and Energy balances in Excel; Introduction to Maple; Use of Maple to solve basic and advance mathematics problems; Programming in Maple; Applications of all software in industry.

CHE319 – Technology Management (3 Units)
The Management of Research and Development – what is R & D?, basic and Applied Research; R & D. Economics of Invstment Analysis: Time valve of money, Optimal Investment Criteria, inflation, Unequal Investment Lives. Capital Cost, Manufacuring Cost, Breakeven Production rate, Depreciation, Rate of Return on Investment, Payback Period, Cost Indexes and Cost Scaling. The Management of New Production Development; Benefit, Internal Organization, Coordination, Project Management Techniques, Failure.

Omega Semester

CHE320 - Chemical Engineering Process Analysis II (3 Units)
The use of various forms of thermochemical, Chemical Kinetic and physical data. Use of various forms of plotting data (ternary diagrams, log-log, semi-log, etc) of energy and matter conservation. PRE-CHE310.

CHE321 - Unit Operations I (3 Units)

Stokes and Newton's Laws, flow in particle beds. Characteristics of packed columns. Estimation of fluidisation point and bed expansion. Regions of fluidisation pressure drop, heat and mass transfer in fluidized beds. Sedimentation, flocculation, particle properties, filtration, screen analysis and classification, grinding, centrifuging and electrostatic precipitation.

CHE322 - Chemical Engineering Laboratory II (2 Units)

Fluid circuit system, saponification in a batch reaction, vortex tube, fluid particle system, Double pipe heat exchange.

CHE323 - Transport Phenomena II (3 Units)

Compressible flow: Normal short waves, flow in pipes and nozzles. Cooling Tower Design: psychometric charts, estimation of tower heights, humidifying tower. Drying: Drying mechanisms, estimation of drying periods, description and function of industrial drying.

Conduction: The Fourier equation and application to composites, cylinders and sphere. Analytical and numerical solutions of steady and unsteady state conduction equations. Prerequisite - CHE313.

CHE325 - Chemical Engineering Thermodynamics I (3 Units)

Introduction (definition, scope and aims). Work (quasi – static process, PVT system, path dependency); first law (work and heat, adiabatic work, internal energy, enthalpy, heat capacity); Second law (inter-conversion of work and heat, heat engines and cyclic processes, heat reservoirs/sinks, thermal efficiency, refrigeration cycle, coefficient of performance); entropy; Helmholtz and Gibbs functions; theory of corresponding states; chemical reaction equilibrium; phase equilibrium and phase rule.

CHE326 - Chemical Reaction Engineering I (3 Units)

Classification of reactions, definition and reaction rates, variables affecting reaction rates; homogeneous reactions (elementary and non-elementary reactions), molecularity and reaction order, rate constant, temperature dependency theories, activation energy, constant-volume batch reactor (irreversible reactions of zero, 1st , 2nd and 3rd order; series and parallel reactions, overall order from half-life data; reversible reactions of 1st and 2nd order); variable-volume batch reactor (irreversible reactions of zero, 1st , 2nd and nth order), analysis of total pressure data (homogeneous and auto-catalytic reactions).

GEC320 - Numerical Methods (2 Units)
Numerical Methods: Finite difference. Interpolation. Numerical differentiation and integration. Numerical solution of ordinary differential equations, Trapezoidal, Simpson, Runge Kutta methods. Newton Raphson method for roots of equations. System of simultaneous linear equations. Linear simultaneous equations, Gaussian elimination, Gauss-Seidel iterative method, Jacobi Method, evaluation of determinant and inverse matrix. Eigensystem analysis: system stability, eigenvalue sensitivity, stability of Gauss-Seidel solution, amplitude and time scaling for model studies. Use of numerical analysis software packages to solve simple engineering problems.

GEC321 - Engineer-in-Society II (1 Unit)
Introduction to engineering economy and law for engineers.

GEC324 - Technical Communication (1 Unit)
Introduction to Communications: Principles of effective communication in interpersonal and mass communication process. Verbal, graphical and numerical communications. Written Communication: Principles of technical writing. Types of technical writing, referencing and citation. Styles of writing. Graphs; diagrams presentation. Statistical information presentation. Macro level, and micro-level. Oral Communication: Public speaking skills, multi-media presentation skills. Facilitator and participant skills in meetings. Negotiating skills. Idea-generating skills. Manuscript speaking and presentation involving media and telecommunications. Reading skills: Effective reading skills: extracting main ideas and speed-reading, chunk/cluster-reading and word-attack techniques of technical reading materials. Equipment Manual Writing and Presentation: Component diagrams, assembling, description, and multi-language

presentation. Basic troubleshooting information and technical support information. Marketing strategy.

ECN211 - Principles of Economics I (Micro) (2 Units)
The course deals with a more in-depth treatment of ECN111. It also introduces the use of quantitative techniques in Micro-economic theory. Topics to be covered include: The subject matter of economics, positive and normative economics, common fallacies in economics, and basic economic question in all types of economics. Theories of demand and supply, equilibrium concept and possibility of disequilibrium with emphasis on cobweb theory; Theory of elasticity of demand and supply with applications. Theory of consumer's behaviour: The cardinalist approach, the indifference curve or ordinalist approach and the revealed preference hypothesis.

400 Level

Alpha Semester

CHE410 - Chemical Engineering Process Analysis III (3 Units)
Use of Mathematical Tools for the Analysis of Chemical Engineering Operations. Process Modelling and Dynamic Analysis. Statistical Test. Regression Design of experiments. (Pre-requisite – CHE320).

CHE411 - Unit Operations II (3 Units)
Physical properties of importance of separation process. Stage wise exchange and equilibrium stages, absorption , evaporation. Binary and multi-component Distillation. Vapour-liquid equilibrium of real solutions. Use of enthalpy- composition diagram. Use of McCabe-Thiele method. Use of Ponchon-Savarit method. Batch distillation, vacuum distillation, azeotropic and extractive distillation. Plate efficiencies, overall Murphree plate and point efficiencies. Extraction (Solid/liquid and liquid/liquid). Continuous contact columns (NTU, HTU, packed and plate columns, hydrodynamic limitations and performance data). Crystallisation. Pre-requisite -CHE321.

CHE412 - Chemical Engineering Laboratory III (2 Units)
Laboratory experiments designed to teach basic and advanced laboratory techniques and practices in Chemical Engineering. Design of experiments. Errors in measurement of experimental results. Selected experiments in Heat Transfer, Mass Transfer, and Chemical Reaction.. Engineering Biochemical Engineering, Process Dynamics and control. All laboratory session are compulsory. Overall grade will consist of 2 parts: (a) written exam at end of laboratory session 25% (b) laboratory report grading (75%). Any student absent from laboratory session with official permission will have to perform the session at suitable date. Average score of reports on all laboratory sessions.

CHE413 - Transport Phenomena III (3 Units)
Mass transfer: Fick's law, diffusion in stationary media, additivity of resistances, diffusion of vapours. Convention: Principles of free and forced convection. Determinations of film transfer coefficients. Heat exchanger design. General diffusion and convection equations Navier-Stokes equation, problems formation and solution. Radiation: Mechanism of radiative heat transfer, shape factors, heat exchange between radiating surface, is radiating networks. Boiling and Condensation: Different phase of boiling, heat transfer coefficient, condensation number, and boiler design. Pre-requisite - CHE323.

CHE414 - Principles of Plant Design I (3 Units)
Process Design Principles, flow sheets, chemical Engineering Design of Mass and Heat Transfer Equipment (Plate columns, absorption towers, distillation columns, heat exchangers, evaporators etc). Mechanical Design of Equipments - Pressure vessels, columns, storage tanks, heat exchanger, etc. Piping and instrumentation. Costing and Project Evaluation.

CHE415 - Chemical Engineering Thermodynamics II (2 Units)
The Euler Equation, Gibbs - Duhem Equation. Phase Equilibria, Partial molar quantities, Gaseous and liquid non-reactive multi-component systems. Chemical equilibria - multicomponents, multiphase systems. Phase transitions. Pre-requisite – CHE325.

CHE416 - Chemical Reaction Engineering II (3 Units)
Classification and types of reasons. Methods of operation and design equations. Temperature stability. Optimization of yield. Departures *from* plug, mixing and RTD. Fluid-solid reaction mass transfer and reaction \- in porous solids. Fixed and fluidized reactor design. Catalyst deactivation. Pre-requisite - CHE326.

CHE431 - Corrosion of Metals and Alloys (2 Units)
Introduction: Effects of corrosion with respect to appearance, performance, safety and cost.Principles of Corrosion; The different Forms of Corrosion; Corrosion Testing and Purposes of testing, Selection of Material; Corrosion Prevention, environment and use of inhibitors; Mineral Acids: Other Environments: organic acids, alkali solutions, seawater, fresh water, the petroleum industry, aerospace: biological corrosion and corrosion in the human body; materials degradation by liquid metals and fused salts. High Temperature Degradation of Materials.

GEC410 Probability and Statistics (2 Units)
Probability and Statistics: Probability space, theorems. Conditional probability and independence. random variables, discrete and continuous distributions, mean and variance. Bernouli, Binomial, Poisson, hypergeometric, exponential, normal distributions and their characteristics. Examples of experimental measurement and reliability. Elementary sampling theory for normal population. Central limit theorem. Statistical inference (point and interval estimation and hypothesis testing) on means, proportions and variances. Power and operating characteristics of tests. Chi-squares test of goodness of fit. Simple linear regressions.

Omega Semester

GEC429 - Student Industrial Work Experience Scheme (SIWES) (6 Units)

Students will spend 6 months in a relevant Chemical Engineering Industry- where report be made to Industry based Supervisors and visiting Supervisor from the Unversity. At the end of the programme, a report will be submitted and an oral presentation made by each student.

500 Level

Alpha Semester

CHE510 - Pulp and Paper Technology (3 Units)

Structural, physical and chemical properties of raw materials for the industry. Preparation of pulpwood. Mechanical, semi-chemical, chemical mechanical, sulphite, sulphite/Kraft pulping processes. Recovery processes of energy and chemicals from pulping processes residuals. Bleaching of pulps and stock preparation. Paper making and finishing operations. Economics and ecological aspects of paper manufacture.

CHE511 - Biochemical Engineering (3 Units)

Methods of solving processing problems imposed by both physical and biological factors in food industries. Theory and design of microbial culture process in the manufacture of pharmaceuticals, commercial enzymes, alcoholic beverages and biological waste treatment.

CHE512 - Process Dynamics and Control (3 Units)

Review of Mathematical concepts) Laplace Transform Process Dynamics (Linear lumped and distributed parameter systems, non-linear system). Feedback control and experimental cases studies. Introduction to Computer Control.

CHE513 - Chemical Engineering Process Design I (3 Units)
A design problem involving the study of a process is given to student. Overview of design report is discussed. Students prepare flow' sheets, heat and materials/mass balances and detailed design of major plant items of the process. Economics, safety and environmental considerations must be stressed. Pre-requisite - CHE410

CHE516 - Chemical Reaction Engineering III (3 Units)
Heterogeneous reactions, classification. Gas-solid non catalytic reactions, Kinetic models – shrinking Core, Progressive conversion, rate law, rate limiting step, determination of rate law, application to reactor design. Gas solid catalytic reaction: and industrial importance definitions, steps and catalytic reaction, rate limiting step. Rate law from mechanisms Reactor design for gas solid catalytic reactions. Deducing rate law, from experimental data. Langmuir Hinshelwood Kinetics, Experimental determination of rate. Application to design of packed bed, moving bed and fluidized bed reaction. Catalyst deactivation and types of deactivation Pre-requisite - CHE416.

CHE517 - Industrial Hazards and Environmental Pollution (3 Units)
Gaseous, liquid and solid pollution: Measurement. types of hazards); Hazardous Wastes/Accident Treatment; Routes of Exposure to Hazards, air pollution control, water pollution control, solid water control. Design and objectives of pollution control system. Cases studies, waste recycling.

CHE518 - Introduction to Polymer Engineering and Processing (3 Units)
Polymer chemistry and polymerisation systems. Polymer characterization, molecular weight measurements, configuration and conformation, transition temperatures, solid-state properties, dynamics mechanical testing. Rubber elasticity, Rheology, Polymer Processing.

CHE519 - Research Project I (0 Unit)
Individual assigned projects under the supervision of an academic staff, projects should focus on national and state industrial problems.

Omega Semester

CHE520 - Inventions and Patents (3 Units)

Discoveries, inventions and their contributions to Development. The Background History of Inventions and their Economic impacts on World-wide development. Examples of inventions in various field of Technology, Management, Socio-economic and Political systems. Patents and Need for Patency. Procedure to obtain the various types of cover. Rights and Trademarks interferences. Breaches of Patient Rights - the Legal Angle. Patency in Developing Economics.

CHE521 - Industrial Chemical Operations and Management (3 Units)

Process Calculation on Management of materials and energy integration of processing steps and equipment on practice. Encyclopaedic Review of the manufacturing Process of various heavy chemical and intermediates. These include sulphuric, hydrochloric and nitric acids, ammonia, caustic soda and potash, soaps and detergents, petrochemical, fertilizers, cement, pulp and paper, industrial fermentation processes and metal ore processing.

CHE522 - Process Optimisation (3 Units)

A Chemical Engineering Treatment of the normal forms of the calculus of Variations, Maximum Principles, Dynamics programming. Optimization of staged System. Optimum Seeking Methods. Network Analysis and Queuing Theory.

CHE523 - Chemical Engineering Process Design II (3 units)

This is a continuation of CHE513.

CHE524 - Principles of Plant Design II (3 Units)

General Design considerations. Siting of plants. Process Services. Materials handling. Industrial hazards and environmental pollution. Process Design Methodology.

CHE526 - PINCH Technology (3 Units)

PINCH Technology and Energy savings. Heat Exchanger Network (HEN) representation, Location of PINCH and significance of PINCH. Design for maximum energy recovery. Minimum number of Heat Exchanger Units,. Splitting of streams. Matching of Units.

CHE527 - Sugar Technology (3 Units)

Description of equipment and consideration of unit operations involved in sugar production and refining from sugar cane (cane sugar).

CHE528 - Petroleum Refinery Engineering and Petrochemical Technology (3 Units)

Introduction to petroleum refining – Refinery products and properties. Some refining processes. Introduction to petro-chemical Technology. Petrochemical precursors, socio-economics, socio-political and geographical implication of the petrochemical industry. Petro-chemical precursors and the chemification of some of these. Planning petrochemical industries for a developing country.

CHE529 - Research Project II (6 Units)

This is a continuation of CHE519.

6.2 DEPARTMENT OF PETROLEUM ENGINEERING

OVERVIEW OF THE DEPARTMENT

At the take-off of the College of Science and Technology on 21st October, 2002, all the academic programmes in the College were grouped into two Departments. The Departments were:

1. Department of Computer and Information Technology
2. Department of Environmental Science

The Department of Computer and Information Technology started with the following Degree Programmes:

- B.Sc Computer Science (4 years)
- B.Sc Management Information System (4years)
- B.Eng Computer Engineering (5 years)
- B. Tech Information Technology (5 years)

These four programmes were under one Department from the beginning of 2002/2003 to the end of the 2003/2004 Academic Session. At the beginning of the 2004/2005 academic session, more Engineering Programmes and Applied Sciences Programmes were added. These additions gave birth to Petroleum Engineering and Chemical Engineering Programmes in October 2004 under one Department. However, Petroleum Engineering became a full- fledged Department in the 2007/2008 Academic Session. It is a 5-year (10 semesters) Programme that leads to the award of Bachelor of Engineering (Honours), B.Eng (Hons), in Petroleum Engineering for successful students. General Engineering courses are taught in the first four semesters, while core Petroleum Engineering courses are taught in the last six semesters. The major areas of concentration are Reservoir Engineering, Drilling and Production Engineering and Formation Evaluation. The 400-level students embark on Students Industrial Work Experience Scheme (SIWES) which involves six months of industrial training, starting immediately after the Alpha Semester.

Vision

The Vision of the Department is to become a leading world-class Department of Petroleum Engineering in a Christian Mission University, committed to raising a new generation of leaders in all fields of human endeavour.

Mission

In line with the Mission of Covenant University, the Department aims to create knowledge and restore the dignity of the Black man via a Human Development and Total Man Concept- driven curriculum employing innovative, leading edge, teaching and learning methods, research and professional services that promote integrated, life-applicable, life-transforming education relevant to the context of Engineering and Human Capacity Building.

Philosophy

The Philosophy of the Department of Petroleum Engineering is in consonance with the overall departure Philosophy of Covenant University. The Department adopts a very practical and realistic approach to the solution of all petroleum engineering problems based upon a sound mastery of underlying theories and principles in order to produce graduates who will impact their society and environment positively and bring about the desired changes that will place Nigeria among the twenty most developed nations of the world by 2020, in alignment with the Millennium Development Goals (MDGs). As such, our products are capable of making informed contributions to the resolution of technological engineering issues in a globalized environment.

Objectives

i. To put in place curricula that cover broad and dynamic engineering principles, working knowledge of entrepreneurial, marketing and management principles.

ii. To empower our students with the necessary skills to create value and bring the solutions needed to tackle challenges in the petroleum and allied industries.

iii. To make our graduates foremost petroleum engineers in the country and internationally through a well-designed competency-based training programme of teaching and research.

iv. To facilitate the acquisition of practical work experience in the industries.

Students in Petroleum Engineering Laboratory during a practical session

LIST OF ACADEMIC STAFF IN TH DEPARTMENT

S/N	NAME	QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	Dr. O.D. Orodu	B.Eng , M.Sc, Ph.D, R.Engr (COREN)	Senior Lecturer/ HOD	Reservoir Characterization, Reservoir Engineering, Petroleum (Production) Economics
2.	Dr. P.A.L. Anawe	B.Sc, M.Sc, Ph.D, R.Engr (COREN), MNSE, MNSChE	Senior Lecturer	Oil and Gas Refining Engineering and Petrochemical Technology, Lubrication Engineering (Tribology), Gas Technology, Environmental Issues
3.	Dr. O.J. Rotimi	B.Sc, M.Sc, Ph.D, MCOMEG, MNAPE	Lecturer I	Geophysical Analysis, Seismic interpretation and inversion, Well -log analysis, Petrophysics, Geostatistical Analysis, Reservoir Geophysics (Characterization)
4.	Mr. G.A. Adeyemi	B.Sc , M.Sc, MNSE	Lecturer II	Production Engineering, Reservoir Engineering
5.	Mr. A.A. Ameloko	B.Sc, M.Sc	Lecturer II	Environmental Geophysics
6.	Mr. S.A. Fadairo	B.Sc, M.Sc, R.Engr (COREN)	Lecturer II	Production Chemistry, Reservoir Engineering, Flow Assurance
7.	Mr. D.O. Oladepo	B.Sc, M.Sc, R.Engr (COREN)	Lecturer II	Production Engineering, Drilling Engineering
8.	Mr. O. O. Mosobalaje	B.Tech, M.Sc	Assistant Lecturer	Reservoir Engineering
9.	Mr. C. Y. Onuh	B.Sc, M.Sc	Assistant Lecturer	Production Engineering
10.	Mrs K.B. Orodu	B.Eng, M.Eng	Assistant Lecturer	Reservoir Engineering
11.	Mr. I. Seteyeobot	B.Eng, M.Eng	Assistant Lecturer	Production/Reservoir Engineering
12.	Mr. E. Enaworu	B.Sc, M.Sc	Assistant Lecturer	Reservoir Engineering, Reservoir Characterization
13.	Mr. D. Alaigba	B.Sc, M.Sc	Assistant Lecturer	Reservoir Engineering, Reservoir Characterization
14.	Mr. R.O. Afolabi	B.Eng, M.Sc	Assistant Lecturer	Petrolum Production Engineering, Reservoir Engineering, EOR

VISITING LECTURERS

S/N	NAME	QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	Professor C.T. Ako	B.Sc, M.Sc, Ph.D, MNSChE, R.Eng (COREN)	Professor	Catalysis and Reaction Engineering, Petroleum Reservoir Engineering
2.	Professor W. Iledare	B.Sc, M.Sc, Ph.D	Professor	Energy Economics & Policy
3.	Prof. D. D. Aribike	B.Sc, M.Sc, Ph.D, MNSChE, R.Eng (COREN)	Professor	Environmental Pollution Engineering. & Management, Petroleum Refining and Petrochemical Engineering
4.	Prof. A.O. Denloye	B.Sc, Ph.D, MNSChE, R.Eng (COREN)	Professor	Separation Processes – Fluidization
5	Dr. O. Falode	B.Sc, M.Sc, Ph.D	Senior Lecturer	Drilling Fluid Formation, Drilling Optimization, Reservoir Engineering

ADJUNCT LECTURERS

S/N	NAME	QUALIFICATION	STATUS	COURSES TAUGHT
1.	Professor O. O. Omatete	BSE, MSE, Ph.D, FNSChE, FNAE, MAIChE, MACeRS, R.Engr (COREN)	Professor	Environmental Engineering
2.	Dr. S. A. Ogbiye	B.Sc, M.Sc, Ph.D, R.Engr (COREN)	Senior Lecturer	Technical Writing & Communication
3.	Dr. D. O. Omole	B.Sc, M.Sc, Ph.D, R.Engr (COREN)	Senior Lecturer	Fluid Mechanics
4.	Dr. H. Okodua	B.Sc, M.Sc, Ph.D	Lecturer 1	Economics
5.	Engr. R. O. Leramo	B.Eng, M.Sc, R.Engr (COREN)	Lecturer II	Technical Drawing Workshop Practice
6.	Dr. D. O. Olukanni	B.Sc, M.Sc, Ph.D, R.Engr (COREN)	Senior Lecturer	Strength of Materials
7.	Prof. C. Ogbulogo	B.A. (Ed.), M.A, Ph.D	Professor	Total Man Concept
8.	Prof. F. A. Oyawale	BSIE, M.Sc, Ph.D, R.Engr (COREN)	Professor	Workshop Technology

TECHNICAL STAFF

S/N	NAME	QUALIFICATION	STATUS	AREA OF SPECIALIZATION
1.	Mrs E. T. Okeniyi	HND	Senior Technologist	Environmental Geology
2.	Mr. O. C. Daramola	Final Diploma	Technologist I	Geology/Mining Techniques
3.	Mr. E. Bolujo	B.Tech	Technologist II	Chemical Engineering
4.	Mr. Iyala Felix	OND	Lab Attendant	Science Laboratory Technology

ADMINISTRATIVE STAFF

S/N	NAME	QUALIFICATION	STATUS
1.	Mr. F. A. Ewulo	B.Sc	Admin Officer I

Students in the Petroleum Engineering laboratory during a practical session

Reservoir Permeability Tester in the Petroleum Engineering laboratory

Lubricity Tester in the Petroleum Engineering laboratory

6.3.1 PETROLEUM ENGIEERING PROGRAMME

PROGRAMME: Petroleum Engineering

DEGREE AWARDED: B.Eng (Honours) Petroleum Engineering

DURATION: Five (5) Years (10 Semesters)

ADMISSION REQUIREMENTS

The minimum requirement for admission into B.Eng Petroleum Engineering Programme is O/L SSCE/GCE/NECO Credit level pass in five (5) subjects, including English, Mathematics, Physics, Chemistry, and either credit pass in Further Mathematics, Biology, or Technical Drawing.

GRADUATION REQUIREMENTS

To graduate from the 5-year Bachelor of Engineering (B.Eng.) Degree Programme in Petroleum Engineering, a student must have successfully completed a minimum of 213 Credit Units as shown below:

Graduation Required Units for (B.Eng.) Petroleum Engineering

Level	Core /Compulsory	Electives	SWEP	Industrial Training [SIWES]	College Courses	University Courses	NUC Courses	Total
100	31					4	10	**45**
200	39		0			4	6	**49**
300	38					4	2	**44**
400	20			6		2		**28**
500	39	4				4		**47**
Total	**167**	**4**	**0**	**6**	**0**	**18**	**18**	**213**

Students performing an experiment in the Petroleum Engineering laboratory

Laboratory session in the Department of Petroleum Engineering

100 Level Petroleum Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC117	Technical Drawing	C	2		α
	MAT111	Mathematics I: Algebra	C	3		α
	MAT112	Mathematics II: Trigonometry and Geometry	C	2		α
	PHY111	Mechanics and Properties of Matter	C	2		α
	PHY112	Heat, Sound and Optics	C	2		α
	PHY119	Physics Practicals IA	C	1		α
	CHM111	General Physical Chemistry	C	3		α
	CHM119	General Chemistry Practical I	C	1		α
	MAT121	Mathematics V: Calculus	C	3		Ω
	MAT122	Mathematics VI: Vector Algebra	C	2		Ω
	PHY121	Electricity and Magnetism I	C	2		Ω
	PHY122	Atomic and Nuclear Physics	C	2		Ω
	PHY129	Physics Practicals IB	C	1		Ω
	CHM121	General Organic Chemistry	C	2		Ω
	CHM122	General Inorganic Chemistry	C	2		Ω
	CHM129	General Chemistry Practical II	C	1		Ω
University Courses	EDS111	Entrepreneurial Development Studies I	V	1		α
	TMC111	Total Man Concept I	V	1		α
	TMC112	Total Man Concept – Sports	V	0		α
	EDS121	Entrepreneurial Development Studies II	V	1		Ω
	TMC121	Total Man Concept II	V	1		Ω
	TMC122	Total Man Concept – Sports	V	0		Ω
NUC Courses	CST111	Use of Library, Study Skills and Information Communication Technology I	U	2		α
	GST111	Communication in English I	U	2		α
	CST121	Use of Library, Study Skills and Information Communication Technology II	U	2	CST111	Ω
	GST121	Communication in English II	U	2	GST111	Ω
	GST122	Communication in French	U	2		Ω
			α =22 Ω = 23 Total = 45 Units			

200 Level Petroleum Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC210	Engineering Mathematics I	C	2	MAT122, MAT 123	α
	GEC211	Introduction to Electrical Engineering 1	C	2		α
	GEC212	Engineering Graphics	C	2		α
	GEC213	Material Science and Raw Material Studies	C	2		α
	GEC214	Applied Mechanics	C	3		α
	GEC215	Applied Computer Programming I	C	2	CST121	α
	GEC216	General Engineering Laboratory I	C	3		α
	GEC217	Engineer-in-Society I	C	1		α
	GEC218	Workshop Technology	C	2		α
	CHM212	Basic Physical Chemistry	C	2		α
	GEC220	Engineering Mathematics II	C	2		Ω
	GEC221	Thermodynamics	C	2		Ω
	GEC222	Computer Aided Design and Manufacture	C	2		Ω
	GEC223	Fluid Mechanics	C	2		Ω
	GEC224	Strength of Materials	C	2		Ω
	GEC225	Applied Computer Programming II	C	2		Ω
	PET220	Introduction to General Geology	C	2		Ω
	PET221	Introduction to Petroleum Engineering	C	2		Ω
	CHM221	Basic Organic Chemistry	C	2		Ω
SWEP	GEC229	Student Workshop Experience Programme (SWEP)	S	0		Ω
University Courses	EDS211	Entrepreneurial Development Studies III	V	1		α
	TMC211	Total Man Concept III	V	1		α
	TMC212	Total Man Concept – Sports	V	0		α
	EDS221	Entrepreneurial Development Studies IV	V	1		Ω
	TMC221	Total Man Concept IV	V	1		Ω
	TMC222	Total Man Concept – Sports	V	0		Ω
NUC Courses	GST211	Logic, Philosophy and Human Existence	U	2		α
	GST221	Nigerian People and Culture	U	2		Ω
	GST222	Peace Studies and Conflict Resolution	U	2		Ω
			α =25 Ω = 24 Total = 49 Units			

***Note:* GEC229 is taken during the long vacation**

300 Level Petroleum Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC310	Engineering Mathematics III	C	3		α
	PET312	Basic Petroleum Geology	C	3		α
	PET313	Reservoir Rock Properties	C	3		α
	PET314	Drilling Engineering I	C	3		α
	PET315	Drilling Fluid Technology	C	3		α
	ECN211	Principles of Economics 1 (Micro)	C	2		α
	GEC320	Numerical Methods	C	2		Ω
	GEC321	Engineer-in-Society II	C	1		Ω
	GEC324	Technical Communication	C	1		Ω
	PET322	Structural Geology and Geological Mapping	C	3		Ω
	PET323	Reservoir Engineering I	C	3		Ω
	PET325	Petroleum Production Engineering I	C	3		Ω
	PET326	Reservoir Fluid Properties and Phase Behaviour	C	3		Ω
	PET327	Petroleum Engineering Laboratory I	C	3		Ω
	MCE326	Fluid Dynamics	C	2		Ω
University Courses	EDS311	Entrepreneurial Development Studies V	V	1		α
	TMC311	Total Man Concept V	V	1		α
	TMC312	Total Man Concept – Sports	V	0		α
	EDS321	Entrepreneurial Development Studies VI	V	1		Ω
	TMC321	Total Man Concept VI	V	1		Ω
	TMC322	Total Man Concept – Sports	V	0		Ω
NUC Course	GST311	History and Philosophy of Science	U	2		α
			α =21 Ω = 23 Total = 44 Units			

400 Level Petroleum Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	GEC410	Probability and Statistics	C	2		α
	PET412	Basic Geophysics	C	3		α
	PET413	Reservoir Engineering II	C	3	PET323, PET326	α
	PET414	Well logging and Interpretation	C	3		α
	PET415	Computer Application in Petroleum Engineering 1	C	3		α
	PET416	Oil and Gas Pollution and Control	C	3		α
	PET417	Units Operation in Natural Engineering	C	3		α
University Courses	EDS411	Entrepreneurial Development Studies VII	V	1		α
	TMC411	Total Man Concept VII	V	1		α
	TMC412	Total Man Concept – Sports	V	0		α
SIWES	GEC429	Student Industrial Work Experienc Schemee (SIWES) [Industrial Training]	S	6		Ω
			α =22 Ω = 6 Total = 28 Units			

A cross section of CU students during a conference organised by Petroleum Engineering Department

500 Level Petroleum Engineering						
Course Grouping	Course Code	Course Title	Status	Units	Pre-requisite	Semester
Compulsory Courses	PET511	Petroleum Production Engineering II	C	3	PET325	α
	PET512	Natural Gas Engineering	C	3		α
	PET513	Reservoir Engineering III	C	3	PET413	α
	PET514	Drilling Engineering II	C	3	PET314	α
	PET515	Oil and Gas Transportation	C	3		α
	PET516	Offshore Drilling and Production Engineering	C	3		α
	PET522	Computer Applications in Petroleum Engineering II	C	3		Ω
	PET523	Rock Physics and Formation Mechanics	C	3		Ω
	PET524	Petroleum Reservoir Modeling and Simulation	C	3		Ω
	PET526	Petroleum Economics	C	3		Ω
	PET527	Petroleum Engineering Laboratory II	C	3		Ω
	PET529	Research Project II	C	6		Ω
Electives	***Note:* Select 4 Units from these electives**					
	PET518	Corrosion and Scale	E	2		α
	PET519	Oil Field Development Planning	E	2		α
	PET528	Industrial Hazard and Environmental Pollution	E	2		Ω
	PET525	Petroleum Refinery Engineering	E	2		Ω
University Courses	EDS511	Entrepreneurial Development Studies IX	V	1		α
	TMC511	Total Man Concepts IX	V	1		α
	TMC512	Total Man Concepts-Sport	V	0		α
	EDS521	Entrepreneurial Development Studies X	V	1		Ω
	TMC521	Total Man Concepts X	V	1		Ω
	TMC522	Total Man Concepts-Sport	V	0		Ω
			α =22 Ω = 25 Total = 47 Units			

COURSE DESCRIPTION

100 level

Alpha Semester

GEC117 - Technical Drawing (2 Units)

Drawing Tools: Description, Uses and Maintenance, Line Work: Definition of points, lines and planes, Types of lines (Description, Uses), Dimensioning: Examples like arrow heads, solid dots and crosses; of straight lines, of circles, inadequate space dimensioning, Common Errors in line drawings, Lettering, Drawing Sheets Format, Border Lines and Title Block. Plane Geometry: Angles (Types and their construction), Triangles (Types and their construction), Quadrilaterals (Types and their construction), Polygons (Types and their construction), Circle and It's Parts, Inscribing and Circumscribing Circles, Tangents (Internal and External), Ellipse (Different Methods of construction), Plane and Diagonal Scales. Orthographic Projection: Basic Introduction: Description, Plan, Elevations, 1st Angle Projection, 3rd Angle Projection, Sectioning, Exercises.

MAT111 - Mathematics 1: Algebra (3 Units)

Algebra of Sets; special sets (NCZCRCC); theory of indices, law of logarithms, indical equations, surdic equations. Polynomials, the remainder and factor theorems; polynomial equations and inequalities-especially linear, quadratic and `cubic. Solving quadratic equation and cubic equations with an integral root. Domain and zeroes of rational functions. Partial fractions. Permutations and combinations. The binomial theorem for any index and applications. Sequences and series of real numbers (including AP and GP). Algebra of complex numbers. Introduction to m x n matrices; elementary operations on matrices and applications to solution of linear equations. Elementary properties of determinants of at most 3 x 3 matrices; The Rule of Sarrus.

MAT112 - Mathematics II: Trigonometry and Geometry (2 Units)
Trigonometric functions; exponential and logarithmic functions. Circular measure; hyperbolic functions. Equations of lines and planes; conic sections (circle, parabola, hyperbola, ellipse).

PHY111 - Mechanics and Properties of Matter (2 Units)
Units and dimensions, scalars and vectors, particle kinematics, Newton's laws, friction, work, energy, centre of mass, simple harmonic motion, rigid body dynamics, kepler's laws, pressure in fluids, intermolecular forces, Hooke's law, Young's modulus, fluid flow streamline turbulence, stroke's law, surface tension.

PHY112 - Heat, Sound and Optics (2 Units)
Temperature, thermometers, heat transfer, PVT –surfaces, Kinetic theory, first and second laws of thermodynamic, transverse and longitudinal waves, standing waves, intensity, beats. Doppler Effect, Electromagnetic spectrum. Huygen's principle, images formed by a single surface thin lenses, aberrations, the eye, optical instruments, interface, single slit, diffraction grating, polarization, elementary examples.

PHY119 - Physics Practical IA (1 Unit)
Simple experiments illustrating the topics covered in PHY 111 and PHY 112.
A selection from the following experiments use of measuring instruments, viscosity, surface tension oscillations about an equilibrium position, Hooke's law, moment of inertia, focal lengths of lenses, refractive index, optical instruments, the sonometer heat capacity, volume expansion and latent heat.

CHM111 - General Physical Chemistry (3 Units)
Historical development of the atom: atoms, Dalton's atomic theory, atomic masses. Fundamental particles of the atom atomic structure. Modern electronic theory of atoms. Periodicity of the elements. Stoichiometry mole concept, chemical formulas, equations and calculations. State of mater; gas, liquid and solid. Chemical energetics and thermo chemistry. Chemical kinetics, equilibria and electrochemistry.

CHM119 - General Chemistry Practical 1 (1 Unit)

Quantitative inorganic and organic analysis for elements in Groups I, II, IIIA, IIIB, IV. Chemical analysis for functional groups: acidic, kenotic carboxylic, etc.

Omega Semester

PHY121 - Electricity and Magnetism I (2 Units)

Coulomb's law, ohm's law, Gauss' Law, capacitors, Ohm's law, Kirchoff's laws, Electrical energy, DC bridges, potentiometer, magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometers, multi-meters, DC and AC motors and generators, power in AC circuits, semiconductors, conductivity and mobility, rectification.

PHY122 - Atomic and Nuclear Physics (2 Units)

Theory of atomic structure., Thompson, Rutherford and Bohr's theories, the hydrogen atom, properties of the electron, e/m, CRO, Millikan's experiment, properties of the nucleus, natural radioactivity, wave particle duality of light, x-rays, photo electricity , thermionic emission, diode valve.

PHY129 - Physics Practical IB (1 Unit)

A selection from the following experiments, potential difference and internal resistance of cells, uses of potentiometer circuit, the meter bridge, simple direct current measuring instruments, Planck's constant, radioactivity.

MAT121 - Mathematics III: Calculus (3 Units)

Functions of Real Variables: Graph, Limits and Concepts of Continuity. Techniques of Differentiation of Algebraic and Trigonometric Functions, Higher Order Derivates, Maxima and Minimal, Leibnitz Rule , Application of Differentiation. Integration as Inverse of Differentiation, Methods of Integration, Definite Integra. Application to Areas, Volumes, Moment of Inertial. Approximate Integration: Trapezoidal and

Simpson's Rule. Taylor's and Mclaurin's Theorems, partial Differentiation and Implicit Differentiation.

MAT122 - Mathematics IV: Vector Algebra (2 Units)

3-Dimensional Cartesian Coordinate Systems. Definition and Representation of Vectors, Algebra of Vectors, Multiplication of a Vector by a Scalar, Addition of Vectors, Scalar Products of two Vectors, Direction Cosines, Calculus of Vector Functions, Differentiation of Vector Function, Integration of Vector Function. Conic: Circles, Parabola, Ellipse and Hyperbola.

CHM121 - General Organic Chemistry (2 Units)

Introduction to and importance of organic chemistry. Qualitative analysis of organic compounds. Isolation and purification of organic compounds. Quantitative analysis of organic compounds. Determination of structure of organic compounds; empirical, molecular and structural formulas. Hybridization; of sp^3, sp^2, sp orbital in carbon. Homologous series and functional groups. Isomerism-structural and stereoisomerism. Aliphatic hydrocarbon chemistry: alkenes, alkynes-nomenclature (IUPAC), physical properties, preparation and chemical reactions with simple mechanism where applicable.

CHM122 - General Inorganic Chemistry (2 Units)

Chemical bonding and structure: ionic, covalent, coordinate covalent (dative), metallic, hydrogen bonding. General properties of compounds formed by the different types of bonding. Influence of bonding on size, shape and structure. Main Group Chemistry (Groups IA – VIIIA): trends in the properties of elements (structure, ionization energies, physical and chemical properties). Properties of selected types of compounds.

CHM129 - General Chemistry Practical II (1 Unit)

Qualitative analysis for common captions and anions. Identification of organic functional groups: hydroxyl, carbonyl, carboxylic, amino groups, sugar, carbohydrate, protein, etc.

200 Level

Alpha Semester

GEC210 - Engineering Mathematics I (2 Units)

Functions, inverse trigonometric functions and principal values, hyperbolic and its inverse, graphs. Concepts of continuity and differentiability. Mean-value theorem. Taylor's series expansion. Integration by parts. Sequences: real numbers, monotone, convergence, limits. Infinite series: convergence tests, addition, multiplication. Power series, radius of convergence, integration, differentiation. Real and imaginary parts, the complex plane, terminology and notation. Complex algebra, DeMoivre's theorem, powers and roots of complex numbers. Euler formula. Elementary functions of a complex variable, polynomials, rational, exponential, trigonometric, hyperbolic, logarithmic, inverse trigonometric and inverse hyperbolic functions. Vectors in Rn space, addition and scalar multiplication, linear combination of vectors, idea of linear dependence and independence. Dot and cross products, triple products, lines and planes.

GEC211 - Introduction to Electrical Engineering 1(2 Units)

Overview of electrical engineering: meaning and description; devices and systems. Brief introduction to electric power system components: generation, transmission, distribution and loading. Basic electric circuit analysis: circuit quantities (voltage, charge and current, power and energy); circuit elements(resistors, capacitors, inductors); basic laws and theorems (ohm's law, voltage divider and current divider rules, star-delta transformations, Kirchoff's laws); AC circuits (sinusoids, phasors and phasor diagrams for circuit elements and their combinations, impedance and admittance, frequency response of RLC circuits, and resonance); power analysis (instantaneous and average power, power triangle, and power factor). Introduction to electrical transformers and machines: fundamentals of magnetic circuits; transformers (principle of operation, ideal and real properties, types and applications); DC and AC machines (constructional features and principles of operation of dc and ac

generators and motors, and applications). Introduction to OP Amps: ideal OP Amp, inverting and non-inverting amplifiers, summing amplifiers, difference amplifiers, cascaded op amp circuits and applications. Introduction to computer and digital systems: digital building blocks (logic circuits, combinatorial and sequential circuits); fundamentals of computer systems and networks. Introductory communications and control systems: communication systems (description, components, types and examples);control systems (description, components, types, and examples).

GEC212 - Engineering Graphics (2 Units)

Lettering, linework, dimensioning, orthographic projection, sectioning, isometric and oblique pictorial views. Graphical calculus, Architectural Drawing, electrical and communication, and IT symbols and drawing.

GEC213 - Materials Science and Raw Materials Studies (2 Units)

Raw material deposit survey in Nigeria: quantity, location, Processing techniques and existing processed products, Material characteristics and composition, Material re-cycling, Physics of materials, Chemistry of materials.

GEC214 - Applied Mechanics (3 Units)

Forces, moments, couples. Equilibrium of simple structures. First and second moments of area; centroids. Kinematics of rigid bodies in plane motion. Applications of Newton's laws of motion. Kinetic energy and momentum analysis. Hooke's law, stresses and strains due to loading and temperature. The stress circle, deflection, deflection of beams. Shear forces and bending moments, analytical and graphical methods for structures. Design and analysis of communication towers, standards, and regulations.

GEC215 - Applied Computer Programming I (2 Units)

Software development life cycle (SDLC). Definitions, SDLC models: Waterfall model, V – shaped model, Incremental model, Spiral model. Program design: Algorithms: Key features of algorithms and different ways of presenting algorithms. Flow charting of algorithm. Pseudocode:

Pseudocode statements for input, output, iteration, decision, and processing, Arithmetic, relational and logical operations on Pseudocode, use of sub – process in Pseudocode. Introduction to QBASIC programming: Symbols, keywords, identifiers, data types, operators, control structure, functions, procedures. Array:: 1-D, and multi-dimensional arrays. File Handling: Concept of a file, files and streams, standard file handling functions, binary files and random access files.

GEC216 - General Engineering Laboratory 1 (3 Units)

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to Electrical Engineering, Materials Science, Applied Mechanics, Applied Computer Programming I and Workshop Technology Courses.

GEC217 - Engineer-in-Society I (1 Unit)

Science, Technology and Development: Ethical concepts of development. Indicators of development, and the role of science and technology. The contribution of the Government to the process of development and the Nigerian experience in the process of economic development (Nigerian Five Year Development Plans, successes and setbacks). Limits of growth, appropriate technology and a new world of science and technology. Science, Technology and Society: The inter-relationship of social ethics and values, and science and technology. Societal needs and resources in the genesis and development of science and technology. Social problems, impact assessment, and control of science and technology. Responsibilities of engineers. Science, Technology and Environment: Disruption or enhancement of environmental quality through harmful or sound science and technology in relation to air, space, water, land, populations, agriculture, industry, wild life, human settlements, culture, education, etc. Ethics and Professionalism: Theistic and secular concepts of personal, social and professional ethics. Codes of conduct of Engineers. Motivation, control, responsibility, rewards and accountability of engineers and development of an ethical engineering professionalism. Council of Engineers and Engineering Societies.

GEC218 - Workshop Technology (2 Units)
Introduction to engineering workshop practice covering mechanical, electrical, information engineering, civil, chemical, and petroleum engineering. Use of hand tools, and safety measures in these fields.

CHM212 - Basic Physical Chemistry (2 Units)
Kinetic theory of gases. Molecular velocities and their distribution. Carnot Cycle. Second law of thermodynamics. Entropy and free energy. Principles and applications of free energy concepts in determining spontaneity of reaction. Experimental methods for the determination of rates of reactions. Formation of rate equation for second, third and fourth order of reaction. Experimental determination of order of reaction. Rates laws, mechanism and theories of elementary processes.

Omega Semester

PET221 - Introduction to Petroleum Engineering (2 Units)
World energy, Characteristics of hydrocarbons, Formation and historical development. Introduction to petroleum industry, Phases in petroleum engineering: (exploration, drilling, reservoir, production, formation evaluation, etc). Economics of the industry, Politics of oil: (OPEC and international markets); Development of petroleum in Nigeria, Contracts and agreements, Journals and publications, Concept of units and dimensions.

PET220 – Introduction to General Geology (2 Units)
The nature and scope of geology, Formation and historical development. Introduction to petroleum industry, Phases in petroleum engineering (exploration, drilling, reservoir, production, formation evaluation, etc), Economics of the industry, Politics of oil: (OPEC and international markes), Developments of petroleum in Nigeria, Contracts and agreements, Journals and publications, Concept of units and dimensions.

GEC220 - Engineering Mathematics II (2 Units)

Partial Differentiation: Functions of several variables, continuity and partial derivatives. Total differentials, approximate calculations using differentials. Chain rule. Implicit differentiation. Series representation of functions, (Maclaurin's and Taylor,s) Taylor's Theorem. Extremum problems, without and with constraints, Lagrange multipliers, global extremum. Ordinary Differential Equations: Definition, degree, order, linear, non-linear, solution. First order equations, separable variables, equations reducible to separable form, exact equations, integrating factors, linear equations. Linear differential equations with constant coefficients, homogeneous, non-homogeneous, complementary functions, particular integrals, D-operator method. General linear second-order differential equations (without using matrices).Power series solution, Legendre's differential equation.

GEC221 - Thermodynamics (2 Units)

Basic concepts, quantitative relations of zeroth, first, second and third laws of thermodynamics. Behaviour of pure substances and perfect gases. Ideal gas cycles.

GEC222 - Computer Aided Design and Manufacture (2 Units)

AutoCAD: principle and use of autocad. Electronic drafting and use of autocad in electrical, electronic, computer and communication engineering design. System's manual writing, component assembly instruction manual preparation. Oral Communication: Public speaking skills with effective use of visual aids and statistical and technical information. Principles of effective communication in interpersonal and mass communication process. Effective reading skills-extracting main ideas and reading for specific information through speed reading. Written Communication: Principles of technical writing.

GEC223 - Fluid Mechanics (2 Units)

Properties of fluids. Fluid statics. Density, pressure, surface tension, viscosity, compressibility, etc. Basic conservation laws, friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamics similitude, principles of construction and operation of selected hydraulic machinery. Hydropower systems.

GEC224 - Strength of Materials (2 Units)

Forces, moments. Equilibrium of simple structures and machine parts. Kinematics of particles and rigid bodies. Newton's laws. Kinetic energy and momentum analysis. Hookes's law, stresses and strains due to loading and temperature change. Stress circle. Deflection of beams. Shear forces and bending moments. Analytical and graphical methods for structures.

GEC225 - Applied Computer Programming II (2 Units)

Review of QBASIC and Introduction of Visual BASIC, Comparison of QBASIC and VBASIC. Creating applications. VBASIC Integrated Development Environment. Menu Design, Use of Procedures, Functions, Subroutines, and Event Procedures. Opening and Saving Pictures to folders. Writing to and Reading from files e.g. Notepad, Ms Word. Writing to and Reading from Database e.g. Access. Writing to and Reading from Text and database over the NET, Printing. Multimedia with VB: Sound, Music, and Video, Animation with VB. Calling other Applications from VB (Shell execute), html, pdf, .doc, files.

GEC229 - Student Work Experience Programme (SWEP) (0 Unit)

Introduction to practices and skills through supervised hands-on workshop exercises in computer engineering and information and communication technology, and related general engineering. These exercises include familiarization with basic tools, soldering and disordering skill of pass-through and surface mount components, building of simple electronic circuits, troubleshooting of electronic devices, digital systems, etc. Use of hand drill. Safety precautions in handling electronics devices. Basic welding skill.

CHM221 - Basic Organic Chemistry (2 Units)

Factors affecting structure and physical properties of organic compounds; factors affecting availability of electrons. Stereochemistry, energy of activation and free radical substitution reactions in alkanes. Electrophilic and necleophilic substitution reactions. Aromaticity. Basic organic reactions, e.g. addition, free radical, elimination and condensation reactions etc. Some named organic reactions.

300 Level

Alpha Semester

GEC310 - Engineering Mathematics III (3 Units)

Matrices and Determinants: Matrices, some special matrices, matrix operations. Determinants and some useful theorems. Laplace's development. Solution of system of linear equations by determinants. Linear dependence and independence, rank of a matrix. General system of linear equations, existence and properties of solution, Gaussian elimination. Matrix inverse by elementary matrices, adjoint, and partitioning methods. Characteristic polynomial, characteristic equation, eigenvalues and eigenvectors. Diagonalization of matrices, application to system of first order linear differential equations. Multiple Integrals:Iterated integrals, multiple integrals over elementary regions. Change of variables, Jacobians. Differentiation of integrals involving a parameter, Leibniz's rule. Vector Algebra: Vector field, gradient and directional derivative, divergence, curl. Line and surface integrals, Stoke's theorem. Volume integrals, divergence theorem. Orthogonal transformations, scale factors, basis vectors. Cylindrical and spherical polar coordinate systems, gradient, divergence and curl in these systems. Fourier Series: periodic functions, trigonometric series. Fourier coefficients, Parsevals theorem, Functions of arbitrary period, even and odd functions. Half range expansion. Complex form of Fourier series. Integral Transform: Derivation of transforms and inverses (Fourier and Laplace). Applications of these transforms in boundary and initial value problems. Z transforms. Partial Differential Equations: Elementary properties of Gamma, Beta, Error, Bessel functions and Legendre polynomials. Basic concepts of partial differential equations. Classification of 2nd order linear partial differential equation into basic types. The principle of superposition. The wave, diffusion and Poisson's equations. Boundary and initial-value problems. D'Alembert's solution for wave equation. Method of separation of variables. Biharmonic equation.

PET312 - Basic Petroleum Geology (3 Units)
Minerals & rocks, Plate tectonics, Geological time & history, Weathering, erosion, & deposition, Geological cycles, Sedimentary processes; (sediment, transport and deposition and Diagenesis); Reservoirs, Structural geology and petroleum Origin, migration; accumulation of petroleum; Reservoirs, Sedimentary basin (Basins in Nigeria and Africa).

PET313 - Reservoir Rock Properties (3 Units)
Concepts of porous medium, Porosity, permeability, saturation, interfacial phenomena (surface energy, surface tension, interfacial tension, capillarity, wettability, contact angle, energy of adhesion, energy of cohesion), compressibility, refractive index and electrical conductivity.

PET314 - Drilling Engineering I (3 Units)
Drilling Technology: rig equipment (rig types, prime movers, drill strings, bits, BOP stacks), rig operations (circulating system, cementing, fishing) Directional Drilling: types (vertical, deviated, horizontal), applications, planning and calculations; Basic Well Control: Concept of pressure, pore pressure, fracture pressure, bottom-hole pressure, pressure losses in circulating system, ECD, kicks and blowouts, lost circulations, calculations.

PET315 - Drilling Fluid Technology (3 Units)
Types, composition and properties, functions, contaminants, Clay mineralogy, borehole, stability (shale/fluid interactions), Mud testing, Rig maths, Drilling hydraulics, hole cleaning and hydraulic optimization, Drilling problems: differential sticking, loss circulation, corrosion.

ECN211 - Principles of Economics I (Micro) (2 Units)
The course deals with a more in-depth treatment of ECN111. It also introduces the use of quantitative techniques in Micro-economic theory. Topics to be covered include: The subject matter of economics, positive and normative economics, common fallacies in economics, and basic economic question in all types of economics. Theories of demand and supply, equilibrium concept and possibility of disequilibrium with emphasis on cobweb theory; Theory of elasticity of demand and supply with applications. Theory of consumer's behaviour: The cardinalist approach, the indifference curve or ordinalist approach and the revealed preference hypothesis.

Omega Semester

PET322 - Structural Geology and Geological Mapping (3 Units)
Folds and faults Stratigraphy Deformation mechanisms Regional aches and domes Diapirs Effects of structures in reservoirs (joints, stylolites and faults) Contouring techniques Using dipin mapping Thickness in deviated wells Isopach and isocore maps Fault-plane maps Heave and throw.

PET323 - Reservoir Engineering I (3 Units)
Reservoir fluid properties Reservoir fluid distribution, classification and drive mechanism Darcy's law Oil displacement concepts Estimation of oil- and gas-in-place Recovery Material balance equation (MBE) and water influx.

PET325 - Petroleum Production Engineering I (3 Units)
Basic well completion design and practices Well hardwares (wellheads and christmas trees, chokes, packers, valves) Corrosion and erosion Perforation Workover techniques and stimulation (hydraulic fracturing, acidizing) Sand control Introduction to coiled tubing (CT) operations.

PET326 - Reservoir Fluid Properties and Phase Behaviour (3 Units)
Thermodynamic review of the properties of ideal and real gases Compressibility equation Oil and gas formation volume factor Gas-oil ratio Composition of oil and gas Classification of reservoir fluids (black oil, dry gas, wet gas, condensates, water) Equations of state PVT analysis Phase behaviour, phase rule and its applications to pure substance, binary and multicomponent systems vapour-liquid equilibria.

PET327 - Petroleum Engineering Laboratory I (3 Units)
Determination of drilling fluid properties: physical properties (density, rheology, sand contents, etc), chemical properties (pH, cation exchange capacity, etc) • Rig maths.

GEC320 - Numerical Methods (2 Units)
Numerical Methods: Finite difference. Interpolation. Numerical differentiation and integration. Numerical solution of ordinary differential equations, Trapezoidal, Simpson, Runge Kutta methods. Newton Raphson method for roots of equations. System of simultaneous linear equations. Linear simultaneous equations, Gaussian elimination, Gauss-Seidel iterative method, Jacobi Method, evaluation of determinant and inverse matrix. Eigensystem analysis: system stability, eigenvalue sensitivity, stability of Gauss-Seidel solution, amplitude and time scaling for model studies. Use of numerical analysis software packages to solve simple engineering problems.

GEC321 - Engineer-in-Society II (1 Unit)
Introduction to engineering economy and law for engineers.

GEC324 - Technical Communication (1 Unit)
Introduction to Communications: Principles of effective communication in interpersonal and mass communication process. Verbal, graphical and numerical communications. Written Communication: Principles of technical writing. Types of technical writing, referencing and citation. Styles of writing. Graphs; diagrams presentation. Statistical information presentation. Macro level, and micro-level. Oral Communication: Public

speaking skills, multi-media presentation skills. Facilitator and participant skills in meetings. Negotiating skills. Idea-generating skills. Manuscript speaking and presentation involving media and telecommunications. Reading skills: Effective reading skills: extracting main ideas and speed-reading, chunk/cluster-reading and word-attack techniques of technical reading materials. Equipment Manual Writing and Presentation: Component diagrams, assembling, description, and multi-language presentation. Basic troubleshooting information, and technical support information marketing strategy.

MCE326 - Fluid Dynamics: Aerodynamics and Hydrodynamics (2 Units)
Thermodynamic and dynamic principles applied to fluid behaviour; stagnation conditions, speed of sound, Mach number and classification of flow, isentropic, Rayleigh, Fanno, Prandtl-Meyer, and shock. Stream function and velocity potential. Vortex and circulation, Viscous flow; boundary layers, separation and turbulent flow. External flows, Lift and drag, thin air fool theory, Finite wing theory and airfool design.

400 Level

Alpha Semester

PET412 - Basic Geophysics (3 Units)
Seismic surveying, Seismic methods, (reflection, refraction), Seismic instrumentation, Relationship between seismic velocities and pore pressure, AVO Electrical method.

PET413 - Reservoir Engineering II (3 Units)
Solutions of the diffusivity equation, Well testing: drawdown, build-up, multi-rate, interference, pulse, and drill-stem test (DST) tests, Superposition and Horner plots, Gas well testing, Coning.

PET414 - Well Logging and Interpretation (3 Units)
Principles and applications of well logging, Open hole log analysis and formation evaluation (electrical, resistivity, SP, Archie's equation, density-

neutron, sonic, gamma ray, calliper logs), Mud logging, Logging-while-drilling (LWD), Introduction to cased-hole log evaluation.

PET415 - Computer Applications in Petroleum Engineering I (3 Units)
Applications of Microsoft Excel spreadsheet and MATLAB in selected mathematical (numerical methods) and petroleum topics.

PET416 - Oil and Gas Pollution and Control (3 Units)
Sources of global environmental problems (air and water pollutions, agricultural activities, population growth, etc); Effects of global pollution (acid rain, ozone layer depletion, global warming); Effects of petroleum operations (exploration, drilling, production operations, terminal operations, refining, gas plants and gas flaring, blending plants, transportation, marketing operations) on the environment – sources and characteristics of wastes; Waste management, Environmental impact assessment (EIA).

PET417- Unit Operations in Natural Gas Engineering (3 Units)
Heat transfer (heaters, heat exchangers, air coolers, mechanics of heat transfer) Separation (separators, principles and dynamics of separation) Dehydration (equipments, principles and dynamics of dehydration) Gas sweetening (equipments, principles and dynamics of sweetening).

Omega Semester

GEC429 - Students Industrial Work Experience (SIWES) (6 Units)
During the SIWES, each student will undergo a practical on the job training in engineering industry approved for its relevance to the student's major for a minimum of 28 weeks starting immediately after the first semester examinations at 400 level. A programme of training will be drawn by the College and the Industry for each student, and a prescribed log book with daily recording of the student activities is to be kept by each student and appropriately signed. At the end of the programme, a written report is to be submitted to the college and each student to present a

seminar on his/her industrial experience. Each student must pass a prescribed certification examination during the industrial training.

500 Level

Alpha Semester

PET511 - Petroleum Production Engineering II (3 Units)
Well inflow (IPR), tubing (VLP), and wellhead (THP) performance relationships Deliverability curves Productivity index Multiphase flow Artificial production (gas lift, pumps) Surface gathering system Emulsion and emulsion treatments Separation and separators.

PET512 - Natural Gas and Condensate Systems (3 Units)
Natural gas and condensate systems Hydrate formation and prevention Acid gases Gas gathering systems (transmission in pipeline networks – series, parallel, loop) Compression of natural gas Gas flow measurement Gas well deliverability.

PET513 - Reservoir Engineering III (3 Units)
Secondary recovery Water flooding Sweep efficiency Stiles method Dykstra-Parsons method Enhanced oil recovery (EOR) Miscible and Immiscible displacements CO_2 flooding Thermal recovery Chemical method.

PET514 - Drilling Engineering II (3 Units)
Advanced well control (driller's method, engineer's method, tripping, stripping, snubbing, bullheading) Casing design Drilling economics (optimization and optimization techniques) Introduction to underbalanced drilling (UBD) Introduction to coiled tubing operations Offshore operations (structures, compensators, Subsea systems, pipelines, flow lines, risers and riser margin).

PET515 - Oil and Gas Transportation (3 Units)
Introduction to petroleum transportation Pipeline in different environment (swamp, arctic, desert, etc) Review Pipeline design (series, parallel, and branched; Pipe grade and wall thickness Multiphase flow in pipelines Pump and compressor stations location Tank farms Vessels (oil tankers, LPG carriers, and LNG carriers).

PET516 - Offshore Drilling and Production Engineering (3 Units)
Introduction Offshore drilling 9rig types, station keeping, marine drilling riser and riser margin, motion compensation, drilling operations, dual-gradient drilling, manager pressure drilling) Offshore operations (types of structures, compensators, Subsea completion, wet and dry trees, flowlines, control lines, manifold and pipelines, production risers).

PET518 - Corrosion and Scale (2 Units)
Introduction to petroleum-related corrosion and scale Thermodynamics and kinetics of electrochemical corrosion of metals and alloys Corrosion and scale inhibition and inhibitors Discussion of current material degradation problems in marine.

PET519- Oil Field Development Planning (2 Units)
Field life cycle, Development planning, TECOP consideration, Case study of development concept selection, Case study of field development planning, Well planning-exploration/appraisal well development, Subsurface development realizations, Surface development options, Unitization, Project management, Integrated operations philosophy and planning.

Omega Semester

PET522 - Computer Applications in Petroleum Engineering II (3 Units)
Application of FORTRAN programming language in selected mathematical and petroleum engineering topics Development of basic simulators.

PET523 - Rock Physics and Formation Mechanics (3 Units)
Elasticity (linear, non-linear, poroelasticity) Geological aspects of rock mechanics Failure mechanics Borehole stresses Rock acoustic Borehole stability Sand production Fracturing. Compaction and subsidence Laboratory tests and analysis.

PET524 - Petroleum Reservoir Modelling and Simulation (3 Units)
Basic principles of reservoir modelling Application of numerical techniques and orthogonal collocation method.

PET526 - Petroleum Economics (3 Units)
Oil concessions and Leases in Nigeria and government participation Oil organizations: OPEC, Its history and workings, relevance in present world oil market membership Nigerian petroleum and gas policy Origins and objectives of the formation of NNPC: Its subsidiaries and functions Time value of money Present value and future value concepts Discounted cash flow and profitability indices Decline curve analysis Risk analysis and probability Decision tree analysis, Drill or not to drill Pricing Mechanism.

PET527 - Petroleum Engineering Laboratory II (3 Units)
Determination of rock and fluid properties Study of flow in porous media and in conduits.

PET529 - Project II (6 Units)
A literature-based or experiment-based study of some topics in petroleum engineering.

PET525 - Petroleum Refining Engineering (2 Units)
Properties of crude oil fractions General overview of refining processes Distillation Flashing Catalytic cracking.

PET528 - Industrial Hazards and Environmental Pollution (2 Units)
Gaseous, liquid, and solid pollution control Design and objectives of pollution control system Waste recycling Case studies.

A Lecturer supervising some students in the Petroleum Engineering laboratory

The Reference Section of Covenant University Library

Demonstration session at the fishery unit of the Centre for Entrepreneurial Development Studies

CHAPTER SEVEN

NATIONAL UNIVERSITIES COMMISSION (NUC) AND UNIVERSITY-WIDE COURSES

7.1 NATIONAL UNIVERSITIES COMMISSION (NUC) COURSES

100 Level

Alpha Semester

CST111 - Use of Library, Study Skills and Information Communication Technology I (2 Units)

- Libraries and Society
  History of the development of libraries, the roles of libraries in various communities, cultural and educational revival, the role of libraries in adult literacy programmes, user studies, planning library services in developing countries.
- Library Resources and their Role in Education
  Information bearing media: books, serials, cartographic materials, CD-ROMs, sound recordings, motion pictures, graphics, machine readable data, use of library materials by teachers and students.
- Reference Sources and Services
  Introduction to reference and Bibliography. Definition and concept of reference services, characteristics and uses of different types of reference materials; selection and evaluation of reference works.
- Conservation of Library Materials
  History of paper and printing, causes of damage to paper with emphasis on tropical areas, processes of book repair or restoration, preservation and repair of non-book materials, library crimes and security.
- Using the Covenant University Library

- Identification of PC parts and peripheral devices: functions, applications, and how to use them. Safety precautions. Procedure for booting a PC.
- Filing system: directory, sub-directory, file, path, and how to locate them.
- Word processing: principle of operation, application, demonstration and practical hand-on exercises in word processing using a popular word processing package.
- Internet: services available, principle of operation, application, demonstration and hand-on practical exercises on e-mail and www using popular browsers.

GST111 - Communication in English I (2 Units)
At the end of the course, students should be able to: Organise their study time, Listen to lectures and effectively manage lecture notes, Develop effective reading habits and increased reading speed, Apply effective methods of summarizing reading materials, & Develop a wide range of vocabulary for a successful academic career.

Omega Semester

CST121 - Use of Library, Study Skills and Information Communication Technology II (2 units)

- <u>Audio-visual resources</u>
  Variety and forms, selection organization and uses, operation and care of both hard and soft ware's. In-house production of audio-visual resources. This demands a lot of cooperation between library staff and lectures.
- <u>Documentation</u>
  Definition, genesis and growth; basic functions, theory and techniques of analyzing, storing and retrieving information through manual and mechanical applications; abstracting; indexing principles and methods.
- <u>Serials Librarianship</u>

Types of serials, importance of serials, selection, organization and uses, storage of serials, print and microform, ISSN, users access through abstracts and indexes.

- Library Automation
- Computers literacy, different types of computers, programming, designs. Value of computers in the library, OPAC, Online database, Internet, search engines, digitization, virtual library etc.
- Overcoming Library Abuse
- Spreadsheet: principle of operation, application, demonstration and practical hand-on exercises in spreadsheet using a popular spreadsheet package.
- Database Management: principle of operation, application, demonstration and practical hand-on exercises in using a popular relational Database Management package.
- Report presentation
- Software package: principle of operation, application, demonstration and practical hand-on exercises in using a popular report presentation package such as Power Point package. Mini-Project to test proficiency in use of the software packages.

GST121 - Communication in English II (2 Units)

GST121 is a continuation of GST111. However, while GST111 concentrated on study skills, with emphasis on reading and summary skills, GST121 will deal with Elements of English Grammar together with the processes of written communication. It will also emphasize skills for eliciting information from simple literary text, as well as a survey of the Nigerian and African literary tradition.

At the end of this course, students should be able to: demonstrate skill for effective communication in English in different social contexts, develop adequate writing skills for academic purpose, and attain a reasonable level of competence for the appreciation of literary texts.

GST122 - Communication in French (2 Units)

The course is designed to enable students to acquire basic conversational/speaking and writing skills. Attention will therefore be focused on the basic grammatical structure and relevant items of vocabulary (lexical items) of the language. The course will be essentially oral but there will also be (reading) comprehension composition (writing) exercises. Module 1: Essentials of the French Language, Pronunciation versus spelling/orthography, pronunciation and recognition of French sounds, Greetings and introducing self, Module 2: Meeting people and introducing them, Describing people: Professions and nationalities, Describing self: family and school, Telling age: days of the week and month of the year, Describing places: countries and cities/towns, Mid-semesters Examination. Module 3: Making request, Making travel arrangements, Departure and arrival at destination, Ordering a meal in a restaurant, Shopping for clothes and other items, Banking transaction of visitor tourist, Revision, and (End of Semester) Examinations.

200 Level

Alpha Semester

GST211 - Philosophy, Logic and Human Existence (2 Units)

The Benefits of the Course include the following: An insight into the search for self-understanding, an unquenchable thirst for the love and pursuit of wisdom, an encouragement for the inquisitive minds to seek answers to the question concerning human existence, and the search for the fundamental beliefs that are rationally justified.

Course Description: Background, Nature and definitions of philosophy. History of Ancient philosophy, History of Medieval philosophy, History of Modern philosophy, African philosophy. Revision and Mid-semester examinations. The Nature of Logic, The Nature of Argument, Laws of Thoughts, Truth-tables, Venn Diagrams, Fallacies. The Question of Life, Purpose and Death. Freewill and Determinism. Existentialism and Humanism.

Omega Semester

GST221 - Nigerian People and Culture (2 Units)

The concept of culture. Study of Nigerian history, culture and arts in pre-colonial times. Social beliefs and the Nigerian's perception of his world. Culture areas of Nigeria and their characteristics. Evolution of Nigeria as political unit. Indigene/settler phenomenon. Concepts of trade, economic self reliance and social justice. Individual and national development, norms and values. Negative attitudes and conducts (cultism and related vices). Re-orientation of moral and national values as well as moral obligations of citizens. Environmental problems.

GST222 - Peace Studies and Conflict Resolution (2 Units)

The concept of conflict: Definitions, Constructive and Destructive angles to understand conflict. The causes of conflict: Contradicting value systems, Competition for scarce resources, Psychological needs of people, Perception (self, others, circumstances, interests), Manipulations of information. Conflict Handling Styles: Avoidance, Confrontation, Role-Playing, Third-Party decision-making, Joint-Problem Solving, Compromising. The life angle of conflict: From Organization-transformation. The concept of peace: Definition of concept; Peace-making, Peace-keeping. Power and conflict: Types of power - Expert power, Referent power, Legitimate power, Reward power, Coercive power.

300 Level

Alpha Semester

GST311 - History and Philosophy of Science (2 Units)

The focus of this course shall be in the discipline of science, which at present, is held in high esteem as the greatest agent of development in the 21st century. This course is a survey of the philosophical foundation of science. Major topical issues in Philosophy of science will be treated. It will begin with a brief account of the the role of metaphysics in scientific explanation, and determinism in the sciences. The student shall therefore be expected to, among other things, examine the main areas of philosophy; the meaning and characteristics of science, explanations in science, its objectives, methods, laws and theories with the view to justifying or debunking the superiority that has been accorded to the discipline of science over other discipline, that is where this becomes necessary. The course will also treat the philosophical thoughts of thinkers like Karl Popper, Copernicus, Newton and Fereyarband.

7.2 UNIVERSITY-WIDE COURSES

100 Level

Alpha Semester

EDS111 - Entrepreneurial Development Studies I (1 Unit)
Definition of entrepreneurship, Difference between entrepreneurship and an entrepreneur, Types of entrepreneurship, Who can be an entrepreneur, Benefits and functions of an entrepreneur, Motivations for being an entrepreneur, History of entrepreneurship in Nigeria, the role of entrepreneurship to the Nigeria economic development, Key roles entrepreneurs can play in the development of the Nigerian economy, Demand for entrepreneurship in Nigeria, Management, Entrepreneurship and Intrapreneur, Becoming a successful entrepreneur, Environment of Entrepreneurship, Entrepreneurship and the Nigerian environment, Challenges and Causes of Failure in Entrepreneur Ventures in Nigeria, Constraints faced by entrepreneurs in Nigeria, Entrepreneurship Classification; Identify the different types of entrepreneurship that exists, Identify the merits and demerits associated with different types of entrepreneurship, Demand for money by Nigerian youths, Managing money effectively, Nigerian youths and crave for money, Time Management.

TMC111 - Principles and Parameters of Life (1 Unit)
Exploration and definition of life, Life: purposes and pursuit, Defining Quality of life, Understanding the "good life, Visions and Dreams, Goal Setting, Potentials and Motivation. Steps to soaring, Anchors of life: Moral, ethical values and principles, Prescriptions for living right from biblical/cultural paradigms, Body Segment: Recreation.

TMC112 - Total Man Concept - Sports (0 Unit)
The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

Omega Semester

EDS121 - Entrepreneurial Development Studies II (1 Unit)

Generating Entrepreneurial ideas and translating same with action, Fundamental changes that stimulate entrepreneurship, Entrepreneurship Equation, Components of Entrepreneurial ventures, Elements of entrepreneurship / The Entrepreneurial process and Entrepreneurial Windows, Contributors of Entrepreneurship, The Sources and Approaches to the study of Entrepreneurship, Salaried employment Vs Entrepreneurship, Youths Entrepreneurship, Female Entrepreneurship and Productivity.

TMC121 - Self-Discovery Strategies (1 Unit)

Introducing TMC 012 (Self-discovery principles), Understanding self-discovery and its importance, Steps to self-discovery, Locus of control and attributions. Understanding self-esteem and self-esteem enhancement, Building positive self-concept and self-image, Rubrics for self-actualization, Understanding the make-up of the self: spiritual, physical, psychological and cultural dimensions.. Self in the context of human system : intra/inter systemic levels, Breaking free from the tyranny of "shoulds" and "musts", Attitudes and thoughts, Understanding the developmental stages of human kind.

TMC122 - Total Man Concept - Sports (0 Unit)

The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

200 Level

Alpha Semester

EDS211 - Entrepreneurial Development Studies III (1 Unit)

Biological studies of management giants/ business thinkers in Nigeria, Africa and Europe. Marketing Practice and Entrepreneurship Evolution of marketing, Roles of marketing, Five divisions of marketing, Responsibilities in marketing, Marketing and Sales, Relevance of Entrepreneurship and SMEs and Introduction to International Trade, Definitions of SME's, Advantages and disadvantages, Contributions of SME are to economic development, Institutions and programmers' in support of SME's, Risk Management, Profit Maximization, Definition of International Trade, Drivers of the current international business operations, Forces that make international business environment, International business environment model, Documentary credit in international trade.

TMC211 - Total Self Development Paradigms (I Unit)
Understanding Self-Development, Personal visions and missions, Self-empowerment skills and Strategies, Drive, Passion and Focus, Building Boundaries and Bridges, Positive and creative thinking Life histories of great thinkers, Self-motivation strategies, Personal capacity building, self-auditing and futuristic self projections, Body Segment: Physical exercises.

TMC212 - Total Man Concept -Sports (0 Unit)
The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

Omega Semester

EDS221 - Entrepreneurial Development Studies IV (1 Unit)
Biological studies of management giants/ business thinkers in Nigeria, Africa and Europe. Students will be made to study the lives and characters of different world class, entrepreneurs like Mark Zuckererg, Mukesh Ambani, and Femi Otedola and so many others, Marketing Practice and Entrepreneurship, Evolution of marketing, Roles of marketing, Five divisions of marketing, Responsibilities in marketing, Marketing and Sales, Relevance of Entrepreneurship and SMEs and Introduction to International, Trade, Definitions of SME's, Advantages and disadvantages, Contributions of SME are to economic development,

Institutions and programmers' in support of SME's, Risk Management, Profit Maximization, Definition of International Trade, Drivers of the current international business operations, Forces that make international business environment, International business environment model, Documentary credit in international trade.

TMC221 - Success Parameters (1 Unit)
The focus of this course is on the identification of building blocks of self-development in the context of personal visions, mission and personal capacity building. Major self-motivational blocks, the power and place of focus, the place of the human thought process and how to enhance thinking and reasoning for creativity. Understanding Self-Development, Personal visions and missions, Self-empowerment skills and Strategies, Drive, Passion and Focus, Building Boundaries and Bridges, Positive and creative thinking Life histories of great thinkers, Self-motivation strategies, Personal capacity building, self-auditing and futuristic self projections, Body Segment: Physical exercises.

TMC222 - Total Man Concept - Sports (0 Unit)
The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

300 Level

Alpha Semester

EDS311 - Entrepreneurial Development Studies V (1 Unit)
Introductory class/Biographical studies of management giants/ business thinkers; in Nigeria, Africa and Europe; Quality Control under Entrepreneurship, Customer Service and Customer's relationship; Introduction to Material Management, Impact of modern technologies on Entrepreneurial Venture in Developing Countries; The importance and development of modern technologies for EDS, Acceleration Industrialization through active promotion and development of SMEs;

Role of SMEs in economic development, Developing a technology service system for SMEs Managerial challenges of SMEs; Managing the business growth; different types of business growth, Characteristics of the different types of business growth: Problems associated with growth.

TMC311 - Man in his Socio-Environmental Contexts (1 Unit)
This course examines Man in different environmental contexts – the biblical, biological, cultural and ecological. The emphasis here is the civic and social responsibilities of man in society and the expectations of community living. The place of social relationships, diversity, issues of difference and conflict. The topics include; Origins and historical perspectives of man, Ecological trends, issues and ecosystems, Man and Society: social, historical and current political contexts, Globalization and economic systems, Social relationships and Conflict Resolution, Societal pressure and influences, Individualism and collectivism, Community service, responsiveness and charity supports, Parameters of responsible citizenship, Body Segment: Body Posture.

TMC312 - Total Man Concept - Sports (0 Unit)
The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

Omega Semester

EDS321 - Entrepreneurial Development Studies VI (1 Unit)
This is a continuation of EDS 311. The topics here include; Class/Biographical studies of management giants and business thinkers, Various forms of business, Incorporation of business, Various functions of entrepreneurship; such as Financial Function, Production Function, Marketing Function, Personnel Function, Entrepreneurial succession planning, Challenges and prospects of entrepreneurship, Taking entrepreneurs to the stock markets, e–Commerce/Entrepreneurship, International Entrepreneurship and Business Requirements, Product Creativity and Innovation.

TMC321 - Leadership Development I (1 Unit)

This course examines the building blocks for leadership development in the context of providing an overview of the broad dimensions of leadership. The course also explores the enhancement of leadership traits and how power and influence qualifies the dynamics of leadership. On successful completion of this course, students should be able to: define leadership, describe a leader, explain few theories of leadership, state the various laws and principles of leadership, identify leadership traits, state the levels and domains of leadership, state the principles of power and influence in leadership, identify the features of personal leadership, relate the importance of capacity building in leadership development, identify what constitute the application of leadership, state the relevance of mentoring in leadership development.

TMC322 - Total Man Concept - Sports (0 Unit)

The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

400 Level

Alpha Semester

EDS411 - Entrepreneurial Development Studies VII (1 Unit)

This course is channeled towards exposing the students to the practical aspect of Entrepreneurship particularly the development of skills and to real issues in entrepreneurship 1- 111. The course contents include; Biological studies of business thinkers, entrepreneurs and management: giants, Incorporating the company: practical steps and issues involved, Feasibility studies in Entrepreneurship, Issues involved in partnership and companies registration, Funding of entrepreneurial activities, The Impact of Associations, Institutions and Civil Societies on EDS development in LDCs, Social responsibility and entrepreneurship, Government involvement in entrepreneurship and the impact of entrepreneurship in the public sector, Presentation of Business Proposal and feasibility report.

TMC411 - Leadership Development II (1 Unit)
This is a continuation of TMC321. This second part of the course on leadership development examines the biographical details and leadership traits or styles of some biblical and historical figures and identifies some specific lessons for developing leadership traits and sensitivity. Specific character studies will examine the leadership style of Jesus, Moses, Nehemiah, Paul, Joseph, Esther Alexander the Great, Nelson Mandela, Julius Nyerere, Mother Teresa, Mahatma Ghandi, Martin Luther, Martin Luther King Jnr. Nnamdi Azikwe, Obafemi Awolowo, David Oyedepo etc., Body Segment: Preventive Health Habits.

TMC412 - Total Man Concept - Sports (0 Unit)
The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

Omega Semester

EDS421 - Entrepreneurial Development Studies VIII (1 Unit)
Biological studies of business thinkers, entrepreneurs and management giants. Reviewing/appraising of various strategies and skills for; Poverty Alleviation, Employment through SMEs, Entrepreneurial environments: types, appraising and contending with the environment in Nigeria, Africa/third World countries, Private Sector and economic development, final project / products presentation (on the dream business) and practical defence of their product/business proposal.

TMC421 - Issues in Marriage and Family (1 Unit)
In this course, marriage and family issues are explored looking at God’s mandate and current trends and challenges. The place of the family in societal, national and global development, community service and family

responsibilities vis-à-vis preparation for life in society and family context are explored closely. Preparation for Marriage, Understanding the Family and Family Settings, Family Systems Theory, Family responsibilities, Modern Day Family Trends and Challenges, Roles of Family in Societal, National and Global Development, God's Mandate for Families, The Christian Family Responsibility and Role Sharing in the Family, Parenting: Issues and Practices, Handling Family Finance, Careers and Modern Day Families.

TMC422 - Total Man Concept - Sports (0 Unit)
The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

500 Level

Alpha Semester

EDS511 - Entrepreneurial Development Studies IX (1 Unit)
Who are entrepreneurs and what make them unique (personally, nationally, and internationally) in the development process and historically; what role do they play in the society, nationally and internationally? Case studies; Differentiate between entre- and intra-preneur; Case studies 1: Issues and challenges in starting a business in Nigeria and abroad; the business plan; Case studies 1: Feasibility studies and business finance; case studies; issues in business management; Case studies 3: practicals.

TMC511 - Total Man Concept IX (1 Unit)
Profile Building (Part 1). The emphasis of this course is on experimental learning and it involves pulling together the main stands of TMC from1st year to 4th year. It will introduce a personal dimension by exploring the idea of service from a student centered learning perspective. There will be practical exercises, workshop, projects, and journal keeping and detailed character study.

TMC512 - Total Man Concept: Sports (0 Unit)
The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

Omega Semester

EDS521 - Entrepreneurial Development Studies X (1 Unit)
This course is the continuation of EDS511.

TMC521 - Total Man Concept X (1 Unit)
Profile Building (Part 2). This course follows directly from TMC511 and continuous to explore the personal connections students have made with TMC as a course of study via practical exercises on the specific themes that are addressed in the course of the lecture. The question and discourse emanating from this exercise will enable students to develop their own perspective to the issues of life.

TMC522 – Total Man Concept: Sports (0 Unit)
The focus of TMC - sports is the physical fitness of man. It involves Games, Sports and Athletics.

TMC Sports

AWARDS / ACHIEVEMENTS

- The Centenary ICT Driven University of the Year Award (2014)
- Best Private University in Nigeria by the United States based US Transparency International Standards (USTIS)
- The Best Private University and No 2 Overall Best University in Nigeria and No 25 in Africa on Webometric Ranking (July, 2014)
- Ranked No 1 in Web of Repositories in Nigeria and No 2 in Africa.
- The First University in Nigeria to host two Nobel Prize Winners to an International Conference
- Most Preferred Private University in Nigeria by candidates seeking University admission through JAMB (2014)
- First Class graduates of the University emerged tops in the Presidential Special Scholarship Scheme for Innovation and Development (PRESSID) in Nigeria (2013 & 2014)
- The Best Private University in Nigeria (2013)
- The Best Maintained Educational Institution Award by the Nigerian Chapter of International Facility Management Association (2012)
- The first University in Nigeria and one of the very few in Africa to start training SAP Consultants in collaboration with SAP University Alliances and SAP Education (2012)
- The Bronze Medalist Recipient for the Development of "School Management System" Software Application at an International Innovation Fair – the Seoul International Invention Fair (SIIF), South Korea (2011)
- The Best ICT Driven University in West Africa Award (2010)
- The Best Private University Award (2009)
- The Best ICT Driven University of the Year (2009)
- The Fastest Growing Private University in Nigeria Award (2008)
- The Private University with Most Improved ICT Programme and Facilities by the Commonwealth Scholarship Prize and Awards (CSPA 2007)

POSTGRADUATE ACADEMIC PROGRAMMES

M. Sc/Ph.D Industrial Chemistry
M. Sc/Ph.D Industrial Physics
M. Sc/Ph.D Biochemistry
M. Sc/Ph.D Biology
M. Sc/Ph.D Microbiology
M. Sc/Ph.D Architecture
M. Sc/Ph.D Building Technology
M. Sc/Ph.D Estate Management
M. Sc/Ph.D Computer Science
M. Sc/Ph.D Mgt. Information System
M. Eng/Ph.D Computer Engineering
M.Eng/Ph.D Information & Comm. Engineering
M.Eng/Ph.D Elect &Electronics Engineering
M. Eng/Ph.D Civil Engineering
M. Eng/Ph.D Mechanical Engineering
M. Eng/Ph.D Chemical Engineering
M. Eng/Ph.D Petroleum Engineering
M.A/Ph.D English
M.A/Ph.D Sociology
M.Sc/Ph.D Psychology
M.Sc/Ph.D Accounting
M.Sc/Ph.D Banking and Finance
M.Sc/Ph.D Business Administration
M.Sc/Ph.D Mass Communication
M.Sc/Ph.D Marketing
M.Sc/Ph.D Industrial Relations & Human Resource Management
M.Sc /Ph.D Economics
M.Sc/Ph.D Demography & Social Statistics
M.Sc/Ph.D International Relations
M.Sc/Ph.D Political Science.
M.Sc/Ph.D Policy and Strategic Studies

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The University of Wisconsin Madison

Ithaca College

North-West University
Yunibesiti ya Bokone-Bophirima
Noordwes-Universiteit

Southern University And Agricultural & Mechanical College

Griffith College

UWE Bristol University of the West of England

Teesside University

Fayetteville State University

МГТУ 1830 Bauman Moscow State Technical University

The Tavistock Institute®

Tuskegee University

UGBS University of Ghana Business School

East Carolina University

1921

University of Portsmouth

Centre for Entrepreneurial Development Studies

Computer Laboratory

Some Students' Halls of Residence

Covenant University Health Centre

Covenant University Guest House

Covenant University Sports Complex

CST (L) and Lecture Theatre (R)