THE STUDENTS' HANDBOOK

OF THE

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

COLLEGE OF ENGINEERING AND ENGINEERING TECHNOLOGY

MICHAEL OKPARA UNIVERSITY OF AGRICULTURE UMUDIKE

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PREFACE

This handbook is intended to equip both the undergraduate and postgraduate students of Electrical and Electronic Engineering with adequate information to guide them throughout their program in Michael Okpara University of Agriculture Umudike. It addresses most of the questions that could arise in the course of the programme.

The philosophy of the programme is unbundled in this handbook, and the student is properly instructed in the objectives and prospects of the programme. The student is also informed of the minimum takeaway form each course he/she would offer. Guidance is also provided for the student for various academic issues that may arise in the course of the programme.

The University is an ordered community, and order is the distinguishing feature of a civil society – which the University exemplifies. There is no room for anarchy. Hence, no student should suffer in silence, and at the same time, nobody should take the laws into their hands. This handbook guides the student on the regulations of his/her program, and how to seek redress for any infractions to their rights and privileges by staff or fellow students. The student is also guided to the basic code of conduct in the University, what represents an offence, and the penalty associated with each offence.

It is with joy then, that I recommend this handbook to you, and warmly welcome you to the Department of Electrical and Electronic Engineering, the pride of the University.

Engr Dr I. K. Onwuka
Ag. HOD, EEE
June 2023

SECTION 1

INTRODUCTION

1.1 Programme Overview

Overview

Electrical and Electronics engineers are involved in channelling natural resources into various end-uses such as in heating, lighting, home appliances, consumer products, computing, sensing, control, and communication systems. Electrical and Electronics Engineering are principally concerned with the design, production and the use of systems, subsystems, components and devices whose operation depends on Electrical and Electronics Engineering effects.

They contribute to the development of systems and devices for power, instrumentation, measurement, communication engineering, management, manufacturing, transportation, etc. They are primarily concerned with the processes of generation, transmission, transformation, control, and utilization of energy and/or information.

The entire field of Electrical and Electronics Engineering has expanded rapidly in the last decades and now encompasses a wide range of professional activities. Because of its diversity, it is impossible for an Electrical and Electronics Engineering to be a specialist or expert in all the branches of the field. Normally, specialization is required in consonance with national goals and objectives, for self-reliance and rapid industrialization; graduates with easily identifiable and readily applicable expertise in appropriate areas are required.

The curriculum exposes students to the breadth of electrical and electronics engineering and allows them to pursue electives in several areas including electrical circuits, electronics, electrical power systems, communication systems, signal processing, control systems, electromagnetics, optics/devices, and computer engineering. Hence courses in:

1. Electrical circuits and electronics provide study of basic electrical devices – energy sources, resistors, inductors, capacitors, diodes, and transistors – and their interconnection in operational networks. Circuit analysis and design techniques cover both analogue and digital applications;
2. Power systems emphasize the design and applications of motors, generators, transformers, distribution systems, high-voltage devices, and power electronics;
3. Control systems emphasize the design and application of circuits and systems to automatically monitor and regulate operation of devices, machines, and processes. Advanced technologies using digital control, intelligent processing, neural networks, and programmable logic controllers are included;
4. Communication systems and signal processing cover concepts required for the characterization and manipulation of information-bearing signals, modulation systems, wireless networks, image processing, and signal detection software and hardware. These courses provide instruction in the interaction, propagation, and transmission of high frequency waves and signals through space and in conductors. Topics include grounding and shielding, antennas, microwaves, and systems; and
5. Optics/devices provide a study of solid-state materials, electronic devices, and optoelectronics. Applications are micro-fabrication, telecommunications, computing, instrumentation, lasers and fibre optics, sensing, and smart technologies.

The department of Electrical / Electronic Engineering, College of Engineering and Engineering Technology, Michael Okpara University of Agriculture, Umudike currently offers courses leading to the Bachelor of Engineering with specialization in Electronics and Power Systems Engineering Technology.

1.2 History of the Department of Electrical Electronic Engineering

Edict No. 48 of the Federal Government of Nigeria established the Michael Okpara University of Agriculture, Umudike in May 1993. In due course, it became clear that the mission of the Institution could not be properly achieved, neither could Agriculture be successfully developed nor meaningfully utilized in the industrialization, mechanization and sustenance of the nation without an accompanying College of Engineering. Thus in 2001/2002 academic session, the College of Engineering and Engineering Technology, came into existence with the establishment of the Department of Agricultural Engineering followed in quick succession by Departments of Electrical/Electronic Engineering, Civil Engineering and Mechanical Engineering in the 2003/2004 academic session. Computer Engineering took off in the 2004/2005 academic session and Chemical Engineering in the 2011/2012 academic session. These departments run 5-year degree programmes leading to the award of the Bachelor of Engineering (B. Eng.) degree.

Dr. O. Onuba who started the College of Engineering was also the first Head of the department of Electrical/Electronic Engineering. In the year 2006/2007 academic session, the National Universities Commission (NUC) conducted accreditation exercise in the department for the accreditation of Bachelor's Degree programme. The department was denied accreditation due to certain deficiencies that affected the department. As a result of these, there was no admission into year one during 2006/2007 academic session and the department had a total of 118 undergraduate students.

In the year 2007/2008 academic session, Engr. Dr. L. U. Anih who was on sabbatical leave in the department was appointed the Head of the Department by the Vice-Chancellor and was charged with overall responsibility of organization, coordination, supervision of the various academic activities and day-to-day running of the Department. The Department has two major options: Electronics and Power Systems Engineering.

In 2008/2009 academic session the Department graduated its first students who were seven in number (three second class upper division and four second class lower division). Thereupon, the Department continued to grow in teaching and research facilities, staff strength and student enrolment.

In the year 2008/2009, the Department had nine teaching members of staff with Engr. Prof. O. I. Okoro as the Head of the Department. In this academic year, the department recorded a rapid development in terms of procurement and refurbishing of equipment as well as physical infrastructures. By 2014, Engr Dr A. J. Onah was appointed acting Head of Department, and was succeeded by Engr Dr L. I. Oborkhale, who superintended the 2015 COREN Accreditation. The department had twenty-seven (27) lecturers, four (4) technologists, three (3) technical staff and a total of four hundred and ninety five (495) undergraduate students as at 2015. Engr. Dr P. I. Obi took over as Acting Head of Department from Engr. Dr L. I. Oborkhale, and eventually handed over to him again. Presently, Engr. Dr I. K. Onwuka is the acting head of Department, and the teaching staff strength is thirty five (35).

Through selfless service and relentless efforts, the Department staff struggle extremely hard despite the prevailing economic state of the educational sector of the nation to ensure we produce Engineers who are not only sound academically, but equally can compete excellently with their counterparts in various universities within and outside the country.

SECTION 2
PHILOSOPHY AND PROGRAMME OBJECTIVES

2.1 Philosophy of the Programme

The general philosophy of the Electrical and Electronics Engineering (EEE) programme is in line with the institutional mandate of the College of Engineering and Engineering Technology of Michael Okpara University of Agriculture, Umudike, tailored to produce graduates with high academic and soft skills competence, capable to adequately participate, transform and impact on the Engineering and allied industries in consonance with National and Global community values, including National Policy on Industrialization, food security, and Self-Reliance. The graduates of the Engineering training program would be sufficiently grounded in the basic sciences and Engineering knowledge to cater for the Electrical and Electronic Engineering problems of the nation. They are envisaged to be in the fore-front of indigenous technology development of the nation, predicated on sound theoretical framework, inter-woven with sufficient practical exposure. The practical content of their training will be sufficiently adequate to make them self-reliant and job creators. The above philosophy entails:

1. Adequate exposure to foundation science and general studies courses.
2. Sufficient exposure to basic engineering and engineering technology techniques.
3. Exploring the importance of efficient and sustainable solutions for Electrical and Electronics Engineering challenges, such as achieving sustainable electricity generation, secure distribution, and intelligent communication systems;
4. Providing ample opportunity for practical application and project work as emphasized throughout the course; and
5. Special skills and in-depth study in the students' professional areas of specialization.
6. Producing EEE graduates of high academic and ethical standards with adequate practical exposure for self-employment as well as being of immediate value to industry and the community in general.

The above process involves among other things, lectures, tutorials, laboratories, Engineering/Technology workshop practices, design works and industrial attachments and visitations.

2.2 Mission

The mission of the Department is embedded in the mission of the University, and the mission of the University says:To provide high-quality practical training for students to become professionally competent and confident persons capable of self-employment, to develop environment-friendly and person-sensitive technologies, and to enhance the well-being of the people through extension services and other interventions.

2.3 Vision

The University has a vision to serve Nigeria and humanity through processes that will lead to the alleviation of hunger.

The **Vision** of the University encapsulates its original purpose and what used to be referred to as its Mission and Mandate. The rehearsing of this vision gives anyone associated with it the expectations of the Institution. The University aims to provide the knowledge base for achieving food security, hence its motto: **Knowledge, Food and Security**.

In addition to this, the department holds the following vision:

"To be a leading destination in the Sub-Saharan Africa for industrial solutions and manpower training and development in Electrical and Electronic Engineering processes leading to industrialization and food security."

2.4 Aim of the Programme

The aim of the programme is geared towards the realization of national needs and aspirations through manpower development and research.

2.5 Core Values

Excellence, Integrity and Truth, Commitment and Diligence, Respect, Fairness and Justice.

2.6 The Programme Educational Outcomes (PEOs)

The Programme's Educational Objectives are geared towards the realization of national needs and aspirations. They are also designed with consideration to the visions and missions of the University.

The minimum expectations on the graduates of the Electrical and Electronics Engineering Department embodies the PEOs, which are as in Table 2.1.

Table 2.1: Programme Educational Objectives

S/N	PEO
PEO1	Develop entrepreneurial skills and knowledge, with the spirit of self-reliance, so that they can set up their own businesses.
PEO2	Design, develop and produce innovative policies, products, and services for industrial growth and food security in Nigeria.
PEO3	Adapt and adopt indigenous technology in order to solve engineering and technological problems of the Nation.
PEO4	Function effectively both as an individual and as a team member or leader in diverse and in multi-disciplinary settings.
PEO5	Be thoroughly equipped for postgraduate studies.

2.7 Programme Outcomes and Graduate Characteristics

Programme Outcomes refers to the capabilities the graduates of the Programme are expected to acquire from the training provided by the Programme. The programme outcomes of the Department of Electrical and Electronic Engineering of Michael Okpara University of Agriculture Umudike are presented in table 2.2, showing also the relevant graduate characteristics.

Table 2.2: Programme Outcomes and Graduate Characteristics

S/N	Characteristic	Programme Outcome (Engineer Graduate Profile)
PO1	Engineering Knowledge	Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in K1 to K4 respectively (see Table 2.3) to develop solutions to complex engineering problems
PO2	Problem Analysis	Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development* (K1 to K4)
PO3	Design/ development of sustainable solutions	Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as

		well as resource, cultural, societal, and environmental considerations as required (K5)
PO4	Investigation	Conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (K8)
PO5	Modern Tool Usage	Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems (WK2 engineering and K6)
PO6	The Engineer and the World	When solving complex engineering problems, analyse and evaluate sustainable development impacts* to: society, the economy, sustainability, health and safety, legal frameworks, and the environment (K1, K5, and K7).
PO7	Ethics	Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (K9)
PO8	Individual and Collaborative Team work	Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings (K9)
PO9	Communication	Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.
PO10	Project Management and Finance	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	Lifelong learning:	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (K8)
PO12	Adapting Indigenous Technology and Local Materials in the agrarian communities	Apply engineering and technological principles to simplify, facilitate, modernize, and optimize traditional processes and methods in farming, harvesting, and food preservation; ability to employ locally sourced materials in providing engineering and technological solutions.

2.8 Knowledge Attribute Profile

The curriculum shall encompass the knowledge profile as summarised in the table below:

Table 2.3: Knowledge Attribute Profile

S/No.	Attribute
K1	A systematic, theory-based understanding of the **natural sciences** applicable to the discipline and awareness of relevant **social sciences**
K2	Conceptually-based **mathematics**, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline
K3	A systematic, theory-based formulation of **engineering fundamentals** required in the engineering discipline
K4	Engineering **specialist knowledge** that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline

K5	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports **engineering design and operations** in a practice area.
K6	Knowledge of **engineering practice** (technology) in the practice areas in the engineering discipline
K7	**Knowledge of** the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development*
K8	Engagement with selected knowledge in the current **research literature** of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues
K9	**Ethics, inclusive behaviour and conduct**. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

The UN Sustainable Development Goals (UN-SDG) informed the development of these knowledge profiles.

2.9 Definition of Complex Problem Solving

The range of complex problem solving which the graduate of the programme must be capable of is defined as follows:

Table 2.4: Range of Complex Problem Solving

Attribute	**Complex Engineering Problems** have characteristic P1 and some or all of P2 to P7:
Depth of Knowledge Required	P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach
Range of conflicting requirements	P2: Involve wide-ranging and/or conflicting technical, nontechnical issues (such as ethical, sustainability, legal, political, economic, societal) and consideration of future requirements
Depth of analysis required	P3: Have no obvious solution and require abstract thinking, creativity and originality in analysis to formulate suitable models
Familiarity of issues	P4: Involve infrequently encountered issues or novel problems
Extent of applicable codes	P5: Address problems not encompassed by standards and codes of practice for professional engineering
Extent of stakeholder involvement and conflicting requirements	P6: Involve collaboration across engineering disciplines, other fields, and/or diverse groups of stakeholders with widely varying needs
Interdependence	P7: Address high level problems with many components or sub-problems that may require a systems approach

2.10 Definition of Complex Engineering Activities

The range of complex engineering activities is defined in Table 2.5. Complex engineering activities refer to activities or projects that have some or all the characteristics of Table 2.5.

Table 2.5: Range of Complex Engineering Activities

Attribute	**Complex Activities**
Preamble	**Complex activities** mean (*engineering*) activities or projects that have some or all of the following characteristics:

Range of resources	A1: Involve the use of diverse resources including people, data and information, natural, financial and physical resources and appropriate technologies including analytical and/or design software
Level of interactions	A2: Require optimal resolution of interactions between wide-ranging and/or conflicting technical, non-technical, and engineering issues
Innovation	A3: Involve creative use of engineering principles, innovative solutions for a conscious purpose, and research-based knowledge
Consequences to society and the environment	A4: Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
Familiarity	A5: Can extend beyond previous experiences by applying principles-based app

2.11 Careers and Opportunities

The graduates of the Programme are expected to, first and foremost, be job creators rather than job seekers.

There is a gamut of very broad opportunities for electrical and electronics engineers. Electrical and Electronics Engineers are involved in the design and development of electrical and electronics equipment and in the improvement of the capabilities of existing electrical and electronics equipment. They can also find themselves in software companies involved in the design, manufacture and operation of various engineering devices.

Major companies recruit skilled and capable Electrical and Electronics Engineers to accelerate their growth. However, graduates should also acquire practical knowledge in laboratory sessions and practical in order to be successful in the field. Interested graduates can also progress to the postgraduate level to obtain Masters and Doctorate degrees in any of the specialised areas of Electrical and Electronics Engineering, particularly if they desire to become lecturers and professors in the future. The graduates therefore can find themselves comfortably fixed in many types of work.

The career scope in this field at both national and international levels is excellent. Some of the job profiles which Electrical and Electronics Engineers usually work after graduation are shown in Table 2.6.

Table 2.6: Career Opportunities

Job Title	**Job Description**
Design Engineer	Development of ideas for new products and the systems used to manufacture them. Such systems include consumer electronics (TV, VCRs, CD players, stereo equipment, gaming devices); power generation, transmission and distribution; computer equipment (motherboards, printers, scanners, processors, monitors); communications equipment (transmit-ters and receivers, networks)
Electronics Engineer	Design and creation of everyday devices such as mobile phones and computers.
Manufacturing Engineer	Plant Engineering: servicing and offering support in industrial environment; Power Engineering: safe and reliable power delivery; Control Engineering: design, programming, support to industrial automation; Information Systems Engineering: support to manufacturing processes
Quality Control Engineer	Designing and overseeing the production of various types of complex systems and equipment.

Analysis and Test Engineer	Plan, design, and evaluate products, as well as collaborating with the production department. Technical Service Engineering: troubleshooting, maintenance and repair; Product Testing for quality, safety, performance of equipment
Software Engineer	Software engineers develop, test and improve systems and components including circuit boards, processors, and other devices.
Project Engineer	Planning, implementing, resource forecasting and other technical activities of the project.
System Design Engineer	To research, study and develop new ideas for new products and the system to manufacture them.
Research Engineer	Analysing, implementing and testing the product developed in the laboratory
Field/Sales Engineer	Technical Service Engineering: troubleshooting, maintenance and repair; Product Testing for quality, safety, performance of equipment
Research and Development (R&D)	Product Development; Research to discover/develop new technologies; Training

In addition to Table 2.6, employment opportunities exist in other area such as in oil industries, in shipping and banking industries, in general Management and Security Establishments, Government Ministries and parastatals, in Education and other Technological institutions.

Specifically, prospective employers of the graduates include Power Holding Company of Nigeria, Nigeria Telecommunications Limited and other IT Companies, manufacturing industries, Building and Construction Companies, Nigeria Ports Authority, Rural Electrification Boards, all Federal and States Ministries, all Oil Companies, Banks, Private Institutions, Security Organizations, Academia, etc.

Section 3
Admission and Graduation Requirements

3.1 Requirements and Process for the Admission of Students

The Department offers a five year programme for the Bachelor of Engineering (B.Eng.) Honours Degree in Electrical/Electronic Engineering.

There are two modes of admission into the degree programme of Electrical Electronic Engineering department. The first is admission through the Universal Tertiary Matriculation Exam (UTME) organized by the Joint Admission and Matriculation Board. The second is by Direct Entry Admission through the Joint Admission and Matriculation Board.

i. The admission requirement for UTME candidates into the course is a minimum of 5 (Ordinary level) credit passes in West African Senior Secondary School Certificate (WASSSC), General Certificate of Education (GCE) or in National Examination Council Ordinary Level (NECO) in not more than two sittings. The credits must include English Language, Mathematics, Physics and Chemistry and any other relevant subject. The candidate must not be below 16 years of age. In addition, they must sit for the UTME with the following subject combination: English Language, Mathematics, Physics, and Chemistry.

   The Ordinary Level Results are combined with the UTME result in a Screening Exercise by the University Admission Board (UAB), through a matrix that determines the average score between the two exams. Attaining a mark that is not below the departmental cut off mark, which is determined by the UAB, becomes the basis of admitting the students into the Programme.

   UTME candidates are admitted into the 100 level of the programme.

ii. Direct entry admission is based on a combination of 'O' Level results with the following qualifications: (a) GCE or HSC ('A' Level two papers in Physics, Mathematics or Chemistry), (b) OND (Upper Credit), and (c) HND (Upper Credit).

   Candidates with qualifications as in (a) and (b) above may be admitted into the 200 level and those with the qualifications in (c) may be admitted into the 300 level. All candidates must meet the basic minimum requirement of 5 'O' Level credit passes in relevant subjects as specified in (i) above.

3.2 Graduation Requirement

To satisfy the requirements for graduation, a student must take and pass the minimum units specified in the programme before he/she can qualify for the award of a degree in Engineering or Technology. This includes passing all compulsory General Studies Courses and the Industrial Training courses within a minimum of 6 semesters (for Direct Entry with HND), or 8 semesters (for Direct Entry with OND and "A" Level), or 10 Semesters for UTME candidates).

SECTION 4
ACADEMIC MATTERS

4.1 CGPA Computation and Degree Classifications

Grading of courses shall be done by a combination of percentage marks and letter grades translated into a graduated system of Grade Point Equivalents (GPE). For the purpose of determining a student's standing at the end of every semester, the Grade Point Average (GPA) system shall be used. The GPA is computed by dividing the total number of credit points (TCP) by the total number of Credit Load (Units) (TCL) for all the courses taken in the semester. The credit point for a course is computed by multiplying the number of units for the course by the Grade Point Equivalent of the marks scored in the course.

Table 4.1 shows the letter grades and grade points that can be scored in a course. The determination of the class of degree is based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme. The CGPA is used in the determination of the class of degree as summarized in Table 4.2.

Table 4.1 Grades and Grade points

Percentage score	70-100	60-69	50-59	45-49	40-44	0-39
Letter Grade	A	B	C	D	E	F
Grade point	5	4	3	2	1	0

Table 4.2 CGPA Computation and Degree Classification

CREDIT UNITS	**LETTER GRADE**	**GRADE POINTS (GP)**	**GRADE POINT AVERAGE (GPA)**	**CUMULATIVE GRADE POINT AVERAGE (CGPA)**	**CLASS OF DEGREE**
(i)	**(ii)**	**(iii)**	**(iv)**	**(v)**	**(vi)**
Credit unit vary according to the contact hours assigned to each course per week per semester and also according to work load	A	5	The Grade Point Average is derived by $\sum \frac{((i)\times(iii))}{total\ credit\ unit}$	4.50 – 5.00	1st Class
	B	4		3.50 – 4.49	2^1 Second Class Upper
	C	3		2.50 – 3.49	2^2 Second Class Lower
	D	2		1.50 – 2.49	3rd Class
	E	1		1.00 – 1.49	Pass
	F	0		0.00 – 0.99	Fail

4.2 Course Duration/Tenancy

The maximum length of time allowed to obtain a degree in the college shall be fourteen semesters for the 5-year degree programme and twelve semesters for students admitted directly into the 200 level. For extension beyond the maximum period, a special permission of Senate shall be required on the recommendation of the College Board.

4.3 Probation

A student whose Cumulative Grade Point Average is below 1.00 at the end of a particular year of study, earns a period of probation for one academic session. A student on probation is allowed to register for courses at the next higher level in addition to his/her probation level courses provided that: the maximum of 18 credit units per semester is not exceeded.

(a) The regulation in respect of student work-load is complied with; and

(b) The pre-requisite courses for the higher level courses have been passed.

4.4 Withdrawal and Transfer of Students to other Programmes in the University

A candidate whose Cumulative Grade Point Average is below 1.00 at end of a particular year of probation should be required to withdraw from the University. However, in order to minimise waste of human resources, consideration is usually given to withdrawal from programme of study and possible transfer to other programmes within the University.

4.5 Transfer of Credits

Universities are enjoined to run comparable syllabi to enable students who transfer from one university to another transfer their credits wholly. Students who transfer from one programme to another within the University are also allowed to transfer all their credits relevant to the required courses in the new programme. The student should meet his course adviser to facilitate such transfer of credits.

4.6 Temporary Withdrawal

A student may apply to the Senate for a temporary withdrawal for a whole academic session if for any reason the student is not able to participate in academic activities for that particular session. Such reasons could be financial constraint, poor health, etc. For the reason of poor health, a medical report from a good hospital must be presented and certified by the University Medical Centre.

4.7 Waiver of Semester

A Student will be required to apply to the Chairman of Senate Business Committee for a waiver of any Semester in which he/she has no course to do. This will be subject to recommendations by the College Board.

4.8 Missed Exams

Where a student has a cogent reason to miss an exam, the student will be required to apply to the Chairman of Senate Business Committee for permission to retake the missed exam at the next available opportunity. Where the reasons are not cogent, the student would be required to retake the course as a failed course.

SECTION 5
MISCONDUCTS, SANCTIONS, AND CONFLICT RESOLUTION

The various sanctions for Examination Misconduct and Other Related Offences as Approved by Senate of Michael Okpara University of Agriculture, Umudike at its 134th Regular Meeting Held on May 11, 2011. Are as follows:

Table 5.1 Misconducts and Sanctions

S/N	Offence/Misconduct	Sanction
1.	Communication with any Student in any manner, receiving assistance or giving assistance to another student(s) during examination.	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct.
2.	Impersonation in an examination	Expulsion for the impersonator and the impersonated
3.	Copying or reading from another student's answer script during an examination or opening one's script or material for another student to read or copy.	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct
4.	Bringing into the examination hall/room any unauthorized materials such as books, notes, papers, devices, phones, manuscripts.	Expulsion from the University
5.	Involvement in leaking examination question papers or any form of unauthorized handling of examination questions.	Expulsion
6.	Forging, altering or presenting medical report in order to obtain deferment of an examination or any other benefit	The culprit will face the Student Disciplinary Committee.
7.	Lobbying for examination grades by whatever means	The culprit will face the Student Disciplinary Committee.
8.	Involvement in any other form of cheating or other acts intended to confer undue advantage on the student.	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct.
9.	Aiding, abetting or covering examination misconduct by any student.	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct.
10.	Refusal to make a written statement or sign any of the materials to be used as exhibits in support of an examination misconduct.	Expulsion
11.	Refusal to appear before an examination misconduct or malpractice Committee/Panel	Expulsion
12.	Smuggling of examination question paper out of the examination hall/room while the examination is in progress	Expulsion
13.	Refusal to hand over suspected/incriminating materials	Expulsion
14.	Destruction of suspected/incriminating materials	Expulsion
15.	Failure to return in answer script after an examination	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct.
16.	Writing before the order to begin or after the student has been ordered to stop writing.	The Supervisor shall deduct 10 marks from the student's work.

For other offenses such as fighting, stealing, indecent dressing, promiscuity and other sexual offenses, insubordination, and inciting violence or rebellion to the management, the culprit will be made to face the Student's Disciplinary Committee.

Conflict Resolution

In the case of any victimization against any student, or extortion, or blackmail, or threat of any degree, or conflicts between a student and another student or other University Community members, the student is encouraged to approach his/her Course Adviser to make a complaint. If he/she is not satisfied with the response, the student may approach the Head of Department. Where the student still feels short changed, the student may approach the Dean of the College, or the Dean of Student Affairs if the matter is not resolved at the College.

For matters involving students' campus life, such complaints may be initiated with the Students' Government, to the Dean of Students Affairs.

SECTION 6
CURRICULUM

Table 6.1: Course Listing according to Semesters

Semester	S/ No	Course Code	Course Title	Credit Hours	Pre-requisite Courses	Status
1	1	ENG 111	Introduction to Engineering	1	-	Core
	2	MTH 112	Elementary Mathematics I	3	-	Core
	3	PHY 111	General Physics I	2	-	Core
	4	PHY 112	Elementary Physics I	2	-	Core
	5	PHY 117	General Physics Laboratory I	1	-	Core
	6	CHM 113	General Chemistry I	3	-	Core
	7	CHM 114	Practical Chemistry I	1	-	Core
	8	UGC 111	Farm Practice	1	-	Core
	9	GSS 111	Use of English I	1	-	Core
	10	GSS 112	Nigerian History	2	-	Core
	11	GSS 114	Elementary French I	1	-	Core
	12	GSS 115	Basic German I	1	-	Core
	13	GSS 116	Use of Library	1	-	Core
	Total Credit Hours			**20**		
2	1	ENG 121	Computer Application and Information Technology	2	-	Core
	2	MTH 122	Elementary Mathematics II	3	-	Core
	3	MTH 123	Introduction to Vectors	3	-	Core
	4	PHY 121	General Physics II	2	-	Core
	5	PHY 122	Elementary Physics II	2	-	Core
	6	PHY 127	Physics Lab II	1	-	Core
	7	CHM 121	General Chemistry II	3	-	Core
	8	CHM 124	Practical Chemistry II	1	-	Core
	9	GSS 121	Use of English II	2	-	Core
	10	GSS 124	Elementary French II	1	-	Core
	11	GSS 125	Basic German II	1	-	Core
	12	GSS 126	Social Sciences	2	-	Core
	Total Credit Hours			**23**		
3	1	ENG 211	Thermodynamics I	3	-	Core
	2	ENG 212	Workshop Technology Practice	2	-	Core
	3	ENG 213	Basic Electrical Engineering	3	-	Core
	4	ENG 214	Engineering Drawing I	2	-	Core
	5	ENG 215	Engineering Mechanics	3	-	Core
	6	MTH 211	Mathematical methods I	3	-	Core
	7	MTH 214	Linear Algebra I	2	-	Core
	8	GSS 212	Peace and Conflict Resolution Studies	2	-	Core
	9	GSS 217	Philosophy and Logic	2	-	Core
	Total Credit Hours			**22**		
4	1	ENG 221	Strength of Materials I	2	-	Core
	2	ENG 222	Engineering Drawing II	2	-	Core
	3	ENG 223	Computer Programming	3	-	Core
	4	ENG 224	Material Science	2	-	Core
	5	ENG 225	Fluid Mechanics I	2	-	Core
	6	ENG 226	Engineer in Society	1	-	Core

	7	ENG 200	Student Work Experience Programme	1	-	Core
	8	EEE 221	Basic Electrical Engineering	1	-	Core
	9	MTH 221	Mathematical methods II	3	MTH 211	Core
	10	STA 224	Statistics for Physical Science and Engineering	3	-	Core
	11	GNT 221	Entrepreneurial Studies	2	-	Core
	Total Credit Hours			**23**	-	
5	1	ENG 311	Engineering Economics	2	-	Core
	2	ENG 313	Engineering Analysis	3	-	Core
	3	EEE 311	Electromagnetic Fields and Waves I	3	-	Core
	4	EEE 312	Circuit Theory I	3	ENG 213	Core
	5	EEE 313	Electrical Machines I	2	-	Core
	6	EEE 314	Electrical Machines Lab	1	-	Core
	7	EEE 315	Physical Electronics	3	-	Core
	8	EEE 317	Electrical Power Systems Lab	1	-	Core
	9	EEE 318	Electric Power System Principles I	3	-	Core
	10	GNT 311	Business Development and Management	2	-	Core
	Total Credit Hours			**23**		
6	1	ENG 326	Technical Report Writing and Presentation	1	-	Core
	2	EEE 321	Electric Power System Principles II	2	EEE 318	Core
	3	EEE 322	Electromagnetic Fields and Waves II	3	EEE 311	Core
	4	EEE 323	Circuit Theory II	2	EEE 312	Core
	5	EEE 324	Electronic circuit I	2	-	Core
	6	EEE 325	Electronic Circuit Lab	1	-	Core
	7	EEE 326	Advanced Computer Programming and Statistics	3	-	Core
	8	EEE 327	Measurement and Instrumentation	3	-	Core
	9	EEE 328	Measurement and Instrumentation Lab	1	-	Core
	10	EEE 329	Communication Principles	3	-	Core
	11	ENG 300	Student Work Experience Programme II	1	-	Core
	Total Credit Hours			**23**		
7	1	ENG 418	Computational Methods in Engineering	3	ENG 313	Core
	2	EEE 410	Seminar and Industrial Visit	1	-	Core
	3	EEE 411	Electrical Machines II	2	EEE 313	Core
	4	EEE 412	Communication System	2	EEE 329	Core
	5	EEE 413	Digital Electronics	2	-	Core
	6	EEE 414	Communication Principles Lab	1	-	Core
	7	EEE 415	Electronics Circuits II	2	EEE 324	Core
	8	EEE 416	Control Theory	3	-	Core
	9	EEE 417	Control System Lab	1	-	Core
	10	EEE 418	Data Communications	2	-	Core
	11	EEE 419	Digital Electronics Lab	1	-	Core
	12	GNT 411	Practicum	2	-	Core
	Total Credit Hours			**22**		

8	1	SIWES 400	Students Industrial Work Experience Scheme	15		Core
	Total Credit Hours			**15**		
9	1	EEE 511	Advanced Circuit Techniques	3	-	Elective
	2	EEE 512	Power Electronic Devices and Circuits	3	-	Core
	3	EEE 513	Engineering Management	2	-	Core
	4	EEE 514	Telecommunication Engineering	2	EEE 412	Core
	5	EEE 515	Micro-Computer Hardware and Software Techniques	3	-	Elective
	6	EEE 516	Modelling and Computer Simulation	2	-	Core
	7	EEE 517	Electrical machine Design	2	EEE 411	Elective
	8	EEE 518	Electric Power system Analysis, planning, and Protection	2	EEE 321	Elective
	9	EEE 519	Power System Modelling and Optimization	2	-	Elective
	10	EEE 500	Final Year Project I	3	-	Core
	Total Credit Hours			**18**		
10	1	EEE 520	Introduction to VLSI Technology	2	-	Elective
	2	EEE 521	Solid State Electronics	2	-	Elective
	3	EEE 522	Reliability and Maintainability of Electric Components and Systems	2	-	Core
	4	EEE 523	Industrial Electronics Design	2	-	Elective
	5	EEE 524	Digital Signal Processing	2	-	Elective
	6	EEE 525	Control System Engineering	3	EEE 416	Core
	7	EEE 526	Electric motor Drives	3	-	Elective
	8	EEE 527	Switchgear and High Voltage Engineering	3	-	Elective
	9	EEE 528	Power System Communication and Control	2	-	Elective
	10	EEE 529	Electrical Service Design	2	-	Core
	11	EEE 500	Final Year Project II	3	-	Core
	Total Credit Hours			**18**		

COURSE DESCRIPTION

ENG 111 INTRODUCTION TO ENGINEERING (1 CREDIT)

Learning Outcomes

i. Students should understand the history and evolutions in Engineering
ii. Students should understand the role of Engineers in Nation building
iii. Understand Safety and Risk analysis in Engineering
iv. Understand the human activities, and how they affect the environment

Course Content

Engineering and Technology: Man – his origin and nature; man and his economic environment; scientific methodology; science and technology in the society and service of man. Renewable and non-renewable resources; Man and his energy resources. Environmental effects of chemicals, plastics, textiles, wastes and other materials. Chemical and radio-chemical hazards. Introduction to the various areas of science and technology. Engineer in society: History of Engineering and technology; Safety in

Engineering and Introduction to Risk Analysis. The Role of Engineers in nation building. Invited lecturers form professionals.

MTH 112 ELEMENTARY MATHEMATICS I (3 CREDITS)

Learning Outcomes

i. Define and explain set, subset, union, intersection, complements, and demonstrate the use of Venn diagrams
ii. Solve quadratic equations
iii. Solve trigonometric functions
iv. Solve some problems using binomial theorem

Course Content

Elementary set theory: subsets, union, intersection, compliments, Venn diagrams. Real numbers, integers, rational and irrational numbers; mathematical induction, real sequences and series; theory of quadratic equations; binomial theorem. Complex numbers; algebra of complex numbers, the Argand Diagram. De Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles, trigonometric identities, addition and factor formulae. General solution of trigonometric equations such as $aCos\phi + bSin\phi = c$. Matrices: Introduction to matrices, elementary operations on matrices, determinants of at most *3 x 3* matrices.

PHY 111 GENERAL PHYSICS I (MECHANICS AND PROPERTIES OF MATTER) (2 CREDITS)

Learning Outcomes

i. Students should understand the relevance of Physics to Agriculture
ii. Understand the various expressions of force
iii. Understand the various engineering dimensions, and vector manipulation
iv. Understand the laws, and solve problems related to motions

Course Content

Relevance of physics to Agriculture, Fundamental and Derived Units, Dimensions, vectors; addition and subtraction of vectors. Resolution of vectors, scalar and vector products. Equilibrium. The principle of moments, centre of gravity and its applications in agriculture. Kinematics: displacement, velocity and acceleration. Projectile motion, circular motion, simple Harmonic motion. Dynamics; Newton's laws of mechanics, Elastic and inelastic collision, modulus of elasticity; statics friction, inertia, moment of inertia and torque, properties of matter, Archimedes principle, fluid pressure, blood pressure.

PHY 112 ELEMENTARY PHYSICS I (2 CREDITS)

Learning Outcomes

i. Evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects
ii. Explain and apply the principles of conservation of energy, linear and angular momentum
iii. Describe the laws governing motion under gravity
iv. Explain motion under gravity and quantitatively determine behaviour of objects moving under gravity

Course Content

Space and Time, units and dimensions, frames of reference, Kinematics, Fundamental laws of mechanics, statics and dynamics, work and energy, conservation laws, Galilean Invariance, Universal gravitation, rotational dynamics and angular momentum. Molecular treatment of properties of matter, elasticity, Hooke's law, Young's shear and bulk moduli, Hydrostatics, Pressure, buoyancy, Archimedes' principle, hydro-dynamics; streamlines, Bernoulli and continuity equations, turbulence, Reynold's number, laminar flow, Poiseuile's equations, Surface tension, adhesion cohesion, capillarity, drops and bubbles, temperature; zeroth law of thermodynamics, heat laws of thermodynamics, gas laws, kinetic theory of gases, applications.

PHY 117 GENERAL PHYSICS LABORATORY I (1 CREDITS)

Learning Outcomes

i. Conduct measurements of some physical quantities
ii. Make observations of events, collect and tabulate data
iii. Identify and evaluate some common experimental errors
iv. Plot graphs, and draw conclusions from numerical and graphical analysis of data

Course Content

Relevance of physics to agriculture, fundamental and derived Credits, dimensions, vectors; addition & subtractions of vectors, resolution of vectors, scalar & vector products. Equilibrium, the principle of moments, centre of gravity and its application in agriculture, kinematics displacement, velocity and acceleration, projectile motion, circular motion, simple harmonic motion. Dynamics; elasticity; statics, friction, inertia, moment of inertia and torque, properties of matter, Archimedes principle fluid pressure, blood pressure.

CHM 113 GENERAL CHEMISTRY I (3 CREDITS)

Learning Outcomes

i. Discuss the modern electronic theory of atoms
ii. Rationalise the trends of atomic radii, ionisation energies, electronegativity of the elements, based on their position in the periodic table
iii. Analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy
iv. Determine rates of reactions and its dependence on concentration, time and temperature.

Course Content

Basic principles of matter and energy from the chemist's point of view: atomic theory and molecular structure, stoichemistry, the periodic classification of the elements, atomic structure, chemical bonding, properties of gases, solids, liquids and solutions, chemical equilibrium, ionic equilibrium, chemical thermodynamics, electro-chemistry and chemical kinetics (includes laboratory sessions).

CHM 114 PRACTICAL CHEMISTRY I (1 CREDIT)

Learning Outcomes

i. State the general laboratory rules and safety procedures
ii. Collect scientific data and correct carry out chemical experiments
iii. Record observations and measurements in the laboratory notebooks
iv. Analyse the data to arrive at scientific conclusions.
v.

Course Content

Laboratory exercises drawn from CHM 113.

GSS 111 USE OF ENGLISH I (1 CREDITS)

Learning Outcomes

i. Identify possible sound patterns in English Language
ii. Classify word formation processes
iii. Demonstrate an appreciable level of the art of public speaking and listening
iv. Write simple and technical reports.

Course Content

Listening comprehension: note taking during lectures, note taking from audio-visual equipment, concentration signals and cues as aids to listening comprehension. Phonetics. The use of the Library and Basic Research Methods: Types of Libraries, forms of Library services, cataloguing and book classification schemes, process of data collection/analysis, research writing, process and technique, documentation, references, notes and bibliography, abbreviations in research writing, the finished research report. Reading comprehension: the outline note, summary writing, genre and techniques of reading comprehension: scanning, skimming, intensive/extensive reading, word/text attack skills, SQ3R techniques, varieties of English and Levels of Usage, vocabulary development: word choice and usage denotation and connotation. Term paper writing and submission.

GSS 112 NIGERIAN HISTORY (2 CREDITS)

Learning Outcomes

i. Understand the cultures of the peoples of Nigeria
ii. Understand the political institutions in Nigeria
iii. Understand the Economic Institutions in Nigeria
iv. Understand the environment and health practices in Nigeria

Course Content

The concept of culture, pre-colonial cultures and languages of Nigeria. Principles of kinship. Descent and marriage in Nigerian cultures. Nigerian economic institutions, Nigerian political institutions. Education and development in Nigeria. Religion in Nigerian culture. Culture, environment and health practices in Nigeria.

GSS 114 : ELEMENTARY FRENCH I (1 CREDIT)

Learning Outcomes

i. Understand the French language and its development around the world
ii. French greetings
iii. Personal Introduction
iv. Understanding common French in daily usage

Course Content

Introduction : au pays La France et à la language francaise. Developement de la langue à travers le monde. La Francophonie et les habitants des pays. Pourquoi le francais au Nigeria. La contribution de la France dans le développement de l'Agriculture, de la Science et de la Technologie. Les salutations quotidiennes et usuelles. Preséntation de soi et d'autrui : nom, profession, adresse, et nationalité etc. Les professions dans le secteur agricole. Le personnel de l'université. Identification des gens et des

objets communs. Les nombres car dinaux et ordinaux. S'orienter : trouver son chemin dans le campus. Interrogation et negation a base des verbes les plus usages chaque jour.

GSS 115 BASIC GERMAN I (1 CREDIT)

Learning Outcomes

i. Pronunciation of Alphabets
ii. Understand the use of definite and indefinite articles
iii. Be able to conjugate verbs into present, perfect, future tense, etc
iv. Know numbers

Course Content

Pronunciation of alphabet (A, B, C, D, E, etc) vowels (A, E, I, O, U), Diphthongs (ai, ei, ou, eu, oi, ui) and consonants (b, c, d,). Differentiation of verbs int: Starke, schwache, and Hilfsverb. Conjugation of verbs into presens, Imperfekt, Plusquamperfekt, Futur I, Futur II. Declination of nouns (substantiv); Pronouns (Wir, Ich, du, sie, er, es, 1hr, Sie). The usə of definite and indefinite articles – der, die, das, ein, eine, and their declinations. The use of betimmte and umbestimte Numerale, as well as Adjective and its comparison. Use of capital leters and its importance.
Alltag usages-days of the week, season of the year, timing, the months. The use of Negation –nicht. Interrogation-weiche, was, warum, wer; Hilfsverbs- sein, haben.

UGC 111 FARM PRACTICE (1 CREDIT)

Learning Outcomes

i. Familiar with farm tools and equipment
ii. Familiar with the planting systems and methods
iii. Be familiar with herb and pest control systems
iv. Be familiar with harvest and some post-harvest processes

ENG 121 COMPUTER APPLICATIONS AND INFORMATION TECHNOLOGY (2 CREDITS)

Learning Outcomes

i. Students should be able to understand the use of data processing applications like Excel and Power point
ii. Understand the use and application of some Computer software for solving mathematical problems
iii. Become familiar with the principles of Information Technology, Network and Securities

Synopsis

Computer Application Overview: Data Processing Application and Computations involving Microsoft Excel (Spread sheet), Power point etc. Introduction to Computer Simulation Software: Use of Computer Software for solving mathematical problems. Management Information Systems and Networks: Information Technology, Network and Securities etc.

MTH 122 ELEMENTARY MATHEMATICS II (3 CREDITS)

Learning Outcomes

i. Recognise and understand the meaning of function of a real variable, graphs, limits and continuity
ii. Solve some applications of definite integrals in areas and volumes
iii. Identify the derivative as limit of rate of change
iv. Identify integration as an inverse of differentiation

Course Content

Functions: concept and notation. Polynomial and rational functions. Trigonometric, exponential, and logarithmic functions. Limit and the idea of continuity. The derivative as limit of rate of change. Differentiation of algebraic, trigonometric, exponential and logarithmic functions. Techniques of differentiation. Application to curve sketching, maxima and minima, etc. Integration as inverse of differentiation. Definite and indefinite integrals. Methods of integration (substitution, partial fractions, parts). Application to geometry and mechanics.

MTH 123 INTRODUCTION TO VECTORS (3 CREDITS)

Learning Outcomes

i. Solve some vectors in addition and multiplication
ii. Be able to represent vectors in 1 – 3 dimensions
iii. Be able to solve problems related to scalar and vector products and triple products
iv. Solve differentiation and integration of vectors

Course Content

Equations of straight lines, circles, ellipse, parabola and hyperbola. Tangents and 24ormal. Vectors, laws of vector algebra. Representation of vectors in 1-3 dimensions. Components, and direction cosines. Addition of vectors, and multiplication of a vector by a scalar. Scalar and vector products of two vectors, triple products, vector equation of a straight line and plane.

PHY 121 GENERAL PHYSICS II (2 CREDITS)

Learning Outcomes

i. Be able to use relevant equations to describe the behaviour of waves
ii. To understand Light and Sound as waves
iii. Understand the principles of electric and magnetic fields
iv. Understand the Faraday's law of Electromagnetic Induction

Course Content

Waves: Dynamics of waves. The wave equation, characteristics of waves, stationary waves. Light waves and its characteristics. Imaging, sound wave. Doppler effects. The converging lens. Refraction at plane surfaces. Electricity; electrostatic force. Coulomb's law, electric field and electric potential. Ohm's law, Alternating current, Magnetism; magnetic effects of currents. Permanent magnetism, Ferro-magnetism. Faraday's laws of induction. The potentiometer and the white stone bridge. Concept of heat. Temperature and thermometers.

PHY 122 ELEMENTARY PHYSICS II (2 CREDITS)

Learning Outcomes

i. Be able to solve problems related to electrostatic fields
ii. Identify the behaviour of materials used in electricity (Conductors, and dielectrics)
iii. To understand the applications of the Maxwell's equations
iv. To know the applications of the Wave theory

Course Content

Electrostatics, conductors and currents; dielectrics, magnetic field and induction; Maxwell's equations; Electromagnetic oscillations and waves; applications.

PHY 127 PHYSICS LABORATORY II (1 CREDIT)

Learning Outcomes

i. Conduct measurements of some physical quantities
ii. Make observations of events, collect and tabulate data, and plot graphs
iii. Draw conclusions from numerical and graphical analysis of data
iv. Prepare and present practical reports

Course Content

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques will be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity.

CHM 121 GENERAL CHEMISTRY II (3 CREDITS)

Learning Outcomes

i. Understand the chemistry of first series of transition elements
ii. Understand the Principles of Extraction of Metals
iii. To understand the gradation of representative elements and their compounds
iv. To appreciate nuclear chemistry

Course Content

Application of the principles of chemical and physical change to the study of the behaviour of matter and the interaction between matters. Course content includes, the chemistry of representative elements and their common compounds with emphasis on gradation of their properties – brief chemistry of the first series of transition elements, general principles of extraction of metals; introductory nuclear chemistry (includes Lab Sessions).

CHM 124 PRACTICAL CHEMISTRY II (1 CREDIT)

Learning Outcomes

i. State the general laboratory rules and safety procedures
ii. Identify the basic glassware and equipment in the laboratory
iii. Carry out solubility tests on known and unknown organic compounds
iv. Carry out elemental tests on known and unknown compounds

Course Content

The theory and practice of simple volumetric and qualitative analyses, simple organic preparations, reactions of functional groups and physical determinations.

GSS 121 USE OF ENGLISH II (BASIC GRAMMAR & VARIETIES OF WRITING)

(2 CREDITS)

Learning Outcomes

i. Understand the elements of a sentence, types and varieties
ii. Understand the rules of sentence construction
iii. Apply devices of coherence/logical connectors in paragraphs
iv. Know the different types of writing

Course Content

Each student is required to study a recommended novel.

Basic Grammar: Sentence elements, sentence types and varieties, punctuation and capitalization, abbreviation in sentence construction, homonyms, synonyms, antonyms and acronyms, error identification and correction.

Writing Skills and varieties of writing: the paragraph – devices of coherence/logical connectors, types of writing – narration, description, exposition, and argumentation.

GSS 124 ELEMENTARY FRENCH II (1 CREDIT)

Learning Outcomes

i. Be able to describe specific dates and times
ii. Be able to describe self and others
iii. Know and be able to use some possessive adjectives
iv. Be able to describe places

Course Content

Les jours de la semaine, les mois de l'anneé, la date. Description physiques et psychologiques de soi et des autres personnes Quelle heure est-il ? Description de la vie et des activities quotidiennes ; interrogation et negation. L'alphabet francsais et l' orthographe, introduction à la dictée. Les adjectives possessifs, Le corps humain. A l'hôpital. En ville : à la poste, au marché, à lagare, à la biblionthéque etc. Les autres moyens de transport. La famille, les vétements et les couleurs.

GSS 125 BASIC GERMAN II (1 CREDIT)

Learning Outcomes

i. Be able to define sentences
ii. Be able to understand the forms of German sentences
iii. Understand the basic rules of verb conjugation
iv. Make simple sentences

Course Content

Saiziehre (Sentence Construction): definition of sentences, art and form of German sentences, Das Saizghid. Use of Surfix and Prefix; Use of big and small letters in sentences; Conjugation of verbs.

GSS 126 SOCIAL SCIENCE (2 CREDITS)

Learning Outcomes

i. To have a global perspective on economics, institutions and developments
ii. To understand the basics of trade development in Nigeria
iii. Possess a firm grasp of the state and structure of economics in ECOWAS
iv. Hold an opinion about Nigeria and the economic cooperation in Africa (ECA)

Course Content

A global perspective of economics, institutions and developments. The law of scarcity and the technological choices open to any society. Trade development with special reference to trade in primary products, imports substitution and export possibilities in Nigeria and Third World countries; Nigeria's balance of payments and commercial policies. Economic integration or unions. State and structure of economics of ECOWAS countries. Nigerian and ECOWAS; prospects for industrialization, trade; fiscal and monetary policies for accelerated industrialization. Nigeria and the Economic Co-operation in Africa (ECA).

SECOND YEAR

ENG 211 THERMODYNAMICS I (3 CREDITS)

Learning Outcomes

i. Distinguish heat transfer by conduction, convection and radiation, and calculate the amount of heat energy transferred
ii. Apply the first law of thermodynamics for closed systems and construct conservation of mass and energy equations
iii. Evaluate thermodynamic applications using second law of thermodynamics
iv. Calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat pumps

Course Content

Thermodynamic properties, energy relations and conservation. Paths and processes. Cycle analysis, reversibility. The first law and second law of thermodynamics, entropy. Irreversibility and availability. Air-standard cycles, power and efficiencies. The steady state flow equation (Bernouli Equation) and application. Masses. Elements of vibrated systems. Force and motion relationship in constrained mechanisms.

ENG 212 WORKSHOP TECHNOLOGY/PRACTICE (2 CREDITS)

Learning Outcomes

i. Master workshop and industrial safety practices, accident prevention and ergonomics
ii. Acquire proficiency in the use of engineering measuring instruments
iii. Develop capacity in different metal cutting, shaping, and joining methods
iv. Develop capacity in different wood cutting, shaping, and joining methods
v. Understand the use of conventions and colour coding in electrical engineering

Course Content

Industrial safety: safety code of conduct and safety consciousness. Survey of common sources of accidents in the work place. Accident prevention and control. Use of engineering measuring

instruments: Callipers, gauges. Sheet metal work-layout and Blacksmithing hand tool, cutting, shaping, welding, brazing, soldering, bolting and reverting and working principles. Joints and fastenings: Woodwork: Basic woodworking principle and tools. Types of joints, processing of timber. Introduction to Industrial bolting and riveting. Safety: survey of sources of common accidents, accident prevention and control. Introduction to machine shop: lathe work: shaping, milling and grinding, Electrical workshop practice: convention and application of colour, codes for cables, resistors, etc and signs. Use of simple electrical tools, machines, etc. Measurement and marking: for Uniformity, circulatory, concentricity, etc.

ENG 213 BASIC ELECTRICAL ENGINEERING (3 CREDITS)

Learning Outcomes

i. Discuss the fundamental concepts of electricity
ii. Solve problems related to electric and magnetic fields and circuits
iii. State, explain and apply the basic DC circuit theorems
iv. Solve complex problems related to Power in AC circuits

Course Content

SI System of unit, E.S. and F.M. Fields: Electric field intensity, potential and potential Difference, magnetic field intensity, flux and flux density, Magnetic circuits, inductors. DC circuit Analysis: Kirchoff's Law, Mesh and Nodal Equations, Superposition Theorem. Thevenins Theorem, Norton's Theorem, Maximum power transfer, transients (RL and RC) circuits.

Maximum RMS and average values of waveforms. Inductive and capacitive reactance. Power in ac circuits, use of complex algebra in the solution of circuit, Resonance. Three Phase AC System: Three phase balanced system, Delta/Star connections, line and phase voltages and currents.

ENG 214 ENGINEERING DRAWING I (2 CREDITS)

Learning Outcomes

i. Apply mastery of the use of projections to prepare detailed working drawing of objects and designs
ii. Develop skills in parametric design to aid their ability to see design in the optimal specification of materials and systems to meet needs
iii. Be able to analyse and optimize designs on the basis of strength and material minimization
iv. Be able to translate their thoughts and excitements to produce shop drawings for multi-physical, multidisciplinary design

Course Content

Drawing instruments and the use of graphic tools. Introduction to drawing, measuring, lettering and dimensioning of objects in various views/positions. Engineering geometry. Projections: lines, planes and simple solids. Fundamentals of orthographic projection, first and third angle orthogonal projections, isometric projections. Graphs, charts and presentation of data and results.

Pictorial/freehand sketching. Graphical calculus and Applications.

ENG 215 ENGINEERING MECHANICS (3 CREDITS)

Learning Outcomes

i. Explain the fundamental principles of applied mechanics, particularly equilibrium analysis, friction, kinematics and momentum
ii. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, mathematics and applied mechanics
iii. Synthesize Newtonian Physics with static analysis to determine the complete load impact on all components of a given structure with a load
iv. Apply engineering design principles to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

Course Content

Statics: laws of statics; system of forces and their properties; friction, free body diagrams, equilibrium conditions, vector equations and vector diagrams, simple problems. Particle dynamics: translational motion and rotational motion, general planar motion, kinematics of plane motion. Laws of motion, Newton's law, kinetics of particles, momentum and energy methods. Kinetics of rigid bodies: two dimensional motions of rigid bodies, energy and momentum. Mass and mechanisms. Static and dynamic forced analysis.

MTH 211 MATHEMATICAL METHODS I (3 CREDITS)

Learning Outcomes

i. Analyse the series and tests for convergence of infinite sequences
ii. Describe lines and planes using relevant equations
iii. Apply matrices in the solution of linear algebraic equations
iv. Solve complex problems on product, gradient, divergence, and curl of vectors

Course Content

Series and tests for convergence if infinite sequences and series of numbers. Equation of lines and planes. Matrices determinants, eigen values and eigen functions, matrix solution of linear algebraic equations, dot and cross product of vectors, triple products, vector functions, the gradient, divergence and curl. Vector spaces. Linear dependence and independence (Wronskians and Jacobians). Computer solution of matrices.

MTH 214 LINEAR ALGEBRA I (2 CREDITS)

Learning Outcomes

i. Describe vector spaces over real fields
ii. Determine linear independence, basis, and dimensions of equations
iii. Discuss and be able to solve complex problems in linear transformations
iv. Solve problems related to the algebra of matrices and apply it to the solution of systems of linear equations

Course Content

Vector spaces over the real field. Subspaces. Linear independence, basis and dimension. Change of basis. Linear transformations and their representation by matrices. Range, null space and rank. Singular and non-singular transformations. Algebra of matrices. Systems of linear equations.

GSS 212 PEACE AND CONFLICT RESOLUTION STUDIES (2 CREDITS)

Learning Outcomes

i. Analyse the concepts of peace, conflict and security
ii. List major forms, types and root causes of conflict and violence
iii. Enumerate security and peace building strategies
iv. Describe the roles of international organisations, media and traditional institutions in peace building

Course Content

This course focuses on basic concepts in peace studies and conflict resolution, peace as a vehicle of unity and development, conflict issues, types of conflicts, eg, ethnic/religious/political/economic conflicts, types of conflicts and violence in Africa, indigene/settler phenomenon, peace-building, management of conflict and security, Elements of Peace Studies and conflict resolution. Dispute resolutions (ADR), Dialogue/Arbitration in conflict resolution, roles of international organization in conflict resolution, eg. Economic Community of West African State (ECOWAS), African Union, United Nations, Communal/indigenous conflicts, individual conflict, and terrorism, etc.

GSS 217 PHILOSOPHY AND LOGIC (2 CREDITS)

Learning Outcomes

i. Identify the main branches of philosophy & the centrality of logic in philosophical discourse
ii. Think critically and assess arguments in texts, conversations and day-to-day discussions
iii. Develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge
iv. Guide his or her actions, using the knowledge and expertise acquired in philosophy and logic

Course Content

An overview of philosophy. Definition and uses of philosophy. Philosophy and common sense; philosophy and myth; philosophy and religion; philosophy and science – empiricism. Metaphysics, ethics, epistemology, logic, existentialism.

ENG 221 STRENGTH OF MATERIALS I (2 CREDITS)

Learning Outcomes

i. Recognise a structural system that is stable and in equilibrium.
ii. Determine the stress-strain relation for single and composite members based on Hooke's law, and estimate the stresses and strains in single and composite members due to temperature changes.
iii. Evaluate the distribution of shear forces and bending moments in beams with distributed and concentrated loads
iv. Use Mohr's circle to evaluate the normal and shear stresses in a multi-dimensional stress system and transformation of these stresses into strains
v. Evaluate the stresses and strains due to torsion on circular members and determine the buckling loads of columns under various fixity conditions at the ends

Course Content

Introduction to stress and strain; some simple states of stress and strain; stresses; relationship between loading, shearing forces and bending moment; composite shafts and tensional strain energy. Deflection of beams, Macaulay's method, area moment method, Maxwell's reciprocal rule, built-in and continuous beam in various loading situations; Complex stress and strain, Mohr's stress circle, principal stress and strain, electric constant and volumetric strain; St. Venant's theory; stress in composite materials, bending of plates; membranes. Stresses; stresses in thin cylinders and spheres; thermal stresses; stresses in rivets, joints, etc. use of strain gauge and other measuring devices.

ENG 222 ENGINEERING DRAWING II (2 CREDITS)

Learning Outcomes

i. Apply mastery of the use of projections to prepare detailed working drawing of objects and designs.

ii. Develop skills in parametric design to aid their ability to see design in the optimal specification of materials and systems to meet needs.

iii. Be able to analyze and optimize designs on the basis of strength and material minimization.

iv. Be able to translate their thoughts and excitements to produce shop drawings for multi-physical, multidisciplinary design.

Course Content

Projection of lines and laminae; auxiliary views and mixed projection. Preparation of detailed working drawings for production; semi-detailed drawings, conventional presentation methods. Assembly drawing of machines, devices and installation layout; itemization and part-listing. Drawing office practice and reprographics. Connections in Engineering Drawing. Introduction to IS code of drawing. Conics and engineering curves – ellipse, parabola, hyperbola, cycloid, trochoid, involutes. Projection of planes and solids (cube, prison, pyramid, cylinder, core and sphere.

ENG 223 COMPUTER PROGRAMMING (3 CREDITS)

Learning Outcomes

i. Describe and apply computing, software engineering knowledge, best practices, and standards appropriate for complex engineering software systems.

ii. Discuss algorithm flow charts and pseudo codes.

iii. Develop capacity in computer programming in Fortran, Matlab, C++, or later versions.

iv. Develop proficiency in coding and use of compilers to solve simple engineering analysis problems.

Course Content

Computer, computing and engineering, algorithms flow chart and pseudo code. Computer languages, programming in FORTRAN, Matlab, C++ or later versions. Debugging techniques. Computer code security. Laboratory: hands-on experience on computers through the use of 'Compilers to run programs' and to solve simple analysis problems in fluid, thermodynamics, heat transfer and electrical systems.

ENG 224 MATERIALS SCIENCE (2 CREDITS)

Learning Outcomes

i. Discuss atomic molecular structures and defects in crystals, conductors, and insulators

ii. Discuss the principles of heat treatment and mechanical testing

iii. Describe corrosion and corrosion control techniques

iv. Describe the properties of electrical materials

Course Content

Atomic and Molecular Structures, Crystals. Metallic States. Defects in Crystals, Conductors, Semi-conductors and Insulators. Alloy theory – application to industrial alloys steel in particular. Engineering Properties – their control. Hot and cold working, heat treatment, etc. Principles of mechanical testing, impact test, tensile test, hardness tests, fatigue tests, creep test and non-destructive tests. Fracture. Corrosion and corrosion control. Equilibrium and rate reaction. Non-metallic materials – glass, rubber, concrete, plastics, wood and ceramic materials. Electrical properties. Magnetic materials: properties and characteristics. Domain theory, magnetostic, anisotropy, losses, permanent magnets, transformers, cores. Electric materials: Liquid, solid and organic dielectrics polymers: properties/characteristics, inorganic materials, piezoelectric and ferro-electric materials, composite structures, conductors, superconductors and insulators.

ENG 225 FLUID MECHANICS I (3 CREDITS)

Learning Outcomes

i. Explain the properties of fluids.

ii. Determine forces in static fluids and fluids in motion, and whether a floating body will be stable.

iii. Perform calculations based on principles of mass, momentum and energy conservation.

iv. Perform calculations based on principles of mass, momentum and energy conservation.

v. Perform dimensional analysis and simple fluid modelling problems, and specify the type and capacity of pumps and turbines for engineering applications.

Course Content

Definition of a fluid and fluid properties. Statics of fluid systems, pressure in a static fluid, momentary forces on planes and curved surfaces. Kinematics of fluid motion, streamlines, velocity, acceleration, rotation and circulation.
Buoyancy and floatation, stability of floating and submerged bodies. Types of flow, continuity equation, energy equation, momentum equation, fluid resistance, laminar and turbulent flow in fluids, flow in closed conduits boundary layer concepts. The Euler and Bernoulli equations. Differential analysis. Fluid measurements; pressure, velocity and flow rates. Hydraulics of pipe flow; hydraulic and energy grade lines, pipes in series, parallel pipes, branching pipes, network of pipes, deterioration of pipes. Unsteady flow conduits, water hammer purge control.

ENG 226: ENGINEER IN SOCIETY (1 CREDIT)

Learning Outcomes

i. Differentiate between science, engineering and technology, and relate them to innovation.
ii. Identify and distinguish between the relevant professional bodies in engineering, and the different engineering cadres.
iii. Categorise the goals of global/sustainable development goals (SDG)
iv. Identify and evaluate safety and risk in engineering practice.

Course Content

Philosophy of science. History of Engineering and Technology. Safety in Engineering and Introduction to Risk Analysis. The Role of Engineers in Nation Building. Invited Lectures from professionals.

EEE 221 BASIC ELECTRICAL ENGINEERING LAB. (1 CREDIT)

Learning Outcomes

i. Verify the various dc and ac network theorems
ii. Perform simple experiments on Resistance, Inductance, and capacitance Measurements.
iii. Measure and determine voltage, current, and power in 3-phase star/delta connections.

iv. Identify dc generator excitation methods and load characteristics of a separately excited dc motor
v. Perform open and short circuit tests of a transformer

Synopsis

Resistance measurement; Condition for maximum power transfer; inductance and capacitance measurement; verification of network theorems; ac series circuits. Measurement of power and power factor, excitation of dc generator, load characteristics of a separately excited dc motor; open and short circuit tests for a transformer. Static characteristics of junction diode and transistor, Half and full wave rectification, determination of copper temperature coefficient by Wheatstone bridge, measurement of voltage, current, and power in three phase star/delta connection, simple domestic installation practices.

MTH 221 MATHEMATICAL METHODS II (3 CREDITS)

Learning Outcomes

i. Describe physical systems using ordinary differential equations (ODEs).

ii. Explain the practical importance of solving ODEs, solution methods, and analytically solve a wide range of ODEs, including linear constant coefficient types.

iii. Numerically solve differential equations using MATLAB and other emerging applications.

iv. Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions of complex variables, as well as the theory of conformal mapping to solve problems from various fields of engineering.

Course Content

Review of differentiation and integration methods. Derivation of equations from physics, chemistry, biology, geometry etc. Ordinary differential equations. Applications of first order differential equations. Second order linear equations. Linear dependence and independence. Solutions of second order linear differential equations by method of undetermined coefficients and variation of parameters. Simple Laplace transformation. Solution of initial-value problems by Laplace transform method. Computer solution of selected engineering problems. Excel package.

Double and triple integrals with applications, vector integration and vector integral theorems: divergence, Green's and Stoke's theorems and applications. Functions of more than one variable. Extermination of functions of many variables.

GNT 221 INTRODUCTION TO ENTREPRENEURIAL STUDIES (2 CREDITS)

Learning Outcomes

i. Explain the concepts and theories of entrepreneurship, entrepreneurship, opportunity seeking, new value creation and risk-taking.

ii. Be able to draw up bill of engineering quantities, and material handling.

iii. Describe the stages in enterprise formation, partnership and networking, including business planning.

iv. Describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world.

Course Content

Basic Engineering Business Settings: - Review of engineering business activities Introduction to organizational structure of manufacturing organization. Entrepreneurship and new Venture creation:- Evolution of an industrial, domestic and commercial products to meet the needs of the society. Drawing, Bill of Quantities. Identification of materials- material location, quantity, quality and handling requirements, specification. Quality control and measurement. Cost estimation and marketing of products: market/product mix, market research and market strategy. Group technology task.

STA 224 STATISTICS FOR PHYSICAL SCIENCE & ENGINEERS (3 CREDITS)

Learning Outcomes

i. Apply the principles of Binomial Theorem in the solution of Engineering problems.
ii. Identify the correct application of the poisson, geometric and hyper-geometric distributions.
iii. Analyse data using Normal and Chi-square.

Course Content

Distributions: Binomial, Poisson, Geometric and Hyper-geometric. Continuous probability distributions: Normal, chi-square (x) and F.

ENG 200 STUDENTS WORK EXPERIENCE PROGRAMME (1 CREDIT)

Learning Outcomes

i. Acquire industrial workplace perceptions, ethics, health and safety consciousness, inter-personal skills and technical capabilities needed to give them a sound engineering foundation.
ii. Learn and practise basic engineering techniques and processes applicable to their specialisations.
iii. Acquire competence in technical documentation (log-book) and presentation (report) of their practical experiences.
iv. Build machines, devices, structures or facilities relevant to their specific engineering programmes and applications.

THIRD YEAR

ENG 311 ENGINEERING ECONOMICS (2 CREDITS)

Learning Outcomes

i. Identify the factors of production.
ii. Discuss the effects of supply and demand on prices, and price elasticity..
iii. Discuss money, taxation, budget and international trade.
iv. Acquire proficiency in cost analysis

Course Content

Basic Concepts. Factors of production. Supply and demand. Price elasticity analysis. Household behaviour theories. Business organization. Production, the market, income employment – classical, non-classical, and Keynesian approaches. Money, expenditure, taxation, budget, International trade. Cost analysis: fixed and variable costs, capital cost, cost recovery factor, depreciation and breakeven analysis.

ENG 313 ENGINEERING ANALYSIS I (3 CREDITS)

Learning Outcomes

i. Solve second order differential equations.
ii. Solve partial differential equations and linear integral equations.
iii. Relate integral transforms to solution of differential and integral equations, and explain and apply interpolation formulas.
iv. Apply Runge-Kutta and other similar methods in solving ODE and PDEs.

Course Content

Complex derivatives and analytical functions. Bilinear transformation, conformal mapping, contour integration, Cauchy's integral theory, residue theorem, applications and Riemans surfaces. Special functions, Bessels equation, fourier series and lengendre functions. Simultaneous differential equations with constant coefficients; Laplace transforms methods. Linear second order differential equations with constant and variable coefficients. Classification of second order partial differential equations:- Laplace, wave & diffusion

equations, initials and boundary value problems, separation of variables, similarity solutions. Solution of equations by iteration. Newton-Raphson Method; errors. Numerical differentiation and integration, Simpson's rule. Introduction to interpolation and curve fittings. Statistical Analysis; Regression and correlation – large sampling theory, Test Hypothesis and Quality Control. Introduction to system modeling.

EEE 311 ELECTROMAGNETIC FIELDS AND WAVES 1 (3 CREDITS)

(Pre-requisite ENG 213 Basic Electrical Engineering)

Learning Outcomes

i. Have a firm grasp of vector analysis.
ii. State and explain the various electromagnetic laws.
iii. Apply relevant laws to analyse static electrostatic and magnetic fields
iv. Apply relevant laws to analyse time-varying electrostatic and magnetic fields.

Course Content

Basic Vector Analysis: Gradient, Divergence, Curl, Stokes Theorem, Gauss Theorem, Ampere Circuital law, Faradays law. Electrostatic Fields due to distribution of charge, magnetic fields in and around current carrying conductors. Time varying magnetic and electric fields. Conduction and displacement currents.

EEE 312 CIRCUIT THEORY 1 (3 CREDITS)

(Pre-requisite ENG 213 Basic Electrical Engineering)

Learning Outcomes

i. State, explain and apply circuit theorems to dc circuits.
ii. Obtain the network response to certain input signals using phasor notations and diagrams.
iii. State and apply Laplace transforms to solve passive circuits
iv. Plot Bode diagrams of a given transfer function

Course Content

Network Theorems and network Topology:
Network Theorems, Telegen's Theorem, The Duality Principles, Network Topology, General steady State and Transient Network Solutions. Network Transformations; State space formation of Networks. Magnetically coupled Networks. Resonance in networks.
Time domain analysis of networks:
Application of Integra-differential equation to networks; initial and final conditions. Forced responses and natural behaviours. Step and impulse responses.

EEE 313 ELECTRICAL MACHINES 1 (2 CREDITS)

Learning Outcomes

i. Develop a firm grasp of the electromagnetic theory.
ii. Discuss the electromagnetic conversion principles.
iii. Describe the principle of operation of transformers, dc machines, induction motors, and synchronous machines.

Course Content

Electromagnetic Theory: Field intensity, Flux, Magnetic Circuits, Inductor equivalent circuit. Electromagnetic conversion principles: mechanical energy in basic electromechanical system, torque production, generalized electrical machine.

Transformers: features, principles of operation, equivalent circuit, phasor diagram, regulation, efficiency, rating, three phase delta/star connections.
DC Machines: Classification, Principles of operation, Operating Characteristics, ratings, efficiency, Applications.
Induction machines: Three phase and single phase.
Induction Motors: Classification, Theory and operation, equivalent circuits, phasor diagrams, operating characteristics, rating and efficiency.
Synchronous Machine: Classification, theory of operation, equivalent circuits, phasor diagram. Performance characteristics, rating and efficiency.

EEE 314 ELECTRICAL MACHINES LAB (1 CREDIT)

Learning Outcomes

i. Perform the open circuit and short circuit tests and use results to determine circuit parameters of transformers and induction machines and synchronous machines.
ii. Determine performance characteristics of transformers, DC, Induction, and synchronous machines from experimental.

Course Content

Transformers: Short Circuits and open circuits tests, experimental determination of circuit parameters, efficiency and regulation measurements from load tests, measurement and observation of harmonics in three phase connections.

DC Machines: Measurement of circuit parameter and performance characteristics of DC motors and generators (Separately excited, shunt, series, compound)

Induction Machines: Open Circuit and short circuit tests, loads tests, circuits parameter and efficiency measurements. Synchronous machines, open circuit performance measurements, short circuit tests, load and synchronization tests. Observations and measurements of hysteresis loops. Simple motor drive tests with solid state converters.

EEE 315 PHYSICAL ELECTRONICS (3 CREDITS)

Learning Outcomes

i. Explain the concept of free electron motion in static electric and magnetic field.
ii. Explain the concept electronic structure of matter and conductivity in crystalline solids.
iii. Discuss the theory of energy bands in conductors, insulators and semi-conductors.
iv. Explain the concept of electron emission, carrier and transport phenomena in semiconductors, behaviour of electrons in metals, and understand the characteristics of some electron and photo devices.
v. Understand and explain the behaviour and mode of operations of Fields Effect Transistors, Silicon Controlled Rectifiers, Vacuum Tubes, Photo Resistors, Diodes, Photocell, Light Emitting Diodes and elementary Discrete Device.
vi. Understand the concept behind Integrated Circuit technology and its fabrication techniques.

Course Content
Free electron motion in static electric and magnetic fields, electronics structure of matter, conductivity in crystalline solids. Theory of energy bands in conductors, insulators and semi-conductors: electrons in metals and electron emissions; carriers and transport phenomena in semi-conductors, characteristics of some electron and photo devices, junction diode and transistors, FETs, SCR, vacuum tubes, photo resistors, diodes, transistors, photo cell and light emitting diode, elementary discrete device. Fabrication techniques and IC technology.

EEE 317 ELECTRIC POWER SYSTEMS LAB. (1 CREDIT)

Learning Outcomes

i. Explain the methods of measurement of three phase power.
ii. Synchronize generators to a bus-bar voltage.
iii. Perform system power factor improvement.
iv. Discuss over-current relay tests using simulated faults.

Course Contents

Measurements of differently connected three phase circuits. Verification of methods of measurement of three phase power. Synchronization of generators to busbar voltages. Voltage and current measurements, three phase transmission line models. Power factor improvement tests. Over-current relay tests on simulated faults.

EEE 318 ELECTRIC POWER SYSTEM PRINCIPLES (3 CREDITS)

Learning Outcomes

i. Discuss the sources of electrical energy and the Nigerian Power System.
ii. Describe the principles of transmission and distribution of electric energy.
iii. Explain the construction of overhead lines and underground cables.
iv. Solve complex problems related to load characteristics of power systems

Course Content

Introduction – Power system and sources of electric energy, structure and electric power system, load characteristics. Transmission and distribution of electric energy, current and voltage relations in a transmission line, regulation and losses. Construction of overhead lines and underground cables, power system equipment, standard and safety.

EEE 319 BASIC ELECTRONIC ENGINEERING (2 CREDITS)

Thermoinic devices: Thermoinic, photo and secondary emission, characteristics, parameters and construction of vacuum diode, triodes, tetrodes, pentodes, gas-filled devices and photocell, applications, cathode-ray tube construction and operation.

Semiconductor devices: P-N junction diodes formation, characteristics, equation, rating and uses. Description and uses of Zener, photo and light emitting diodes, solar cells, formation and principles of operation of bipolar junction transistors (BJTs). Characteristics of BJTs in common Base, Common Emitter, Common Collector Configurations, small signal parameters and equivalents circuits, transistor ratings, biasing and graphical analysis of operation. Characteristics and parameters of Junction Field Effect Transistors (JFETs) and Metal Oxide Semiconductor Field Effect Transistor (MOSFETs).

ENG 326: TECHNICAL REPORT WRITING AND PRESENTATION (1 CREDIT)

Learning Outcomes

i. Discuss the principles of effective communication and the professional use of English Language.
ii. Identify the types of technical writing.
iii. Describe the component parts of a typical project report.
iv. Proper presentation of tables and figures in a project report.

Course Contents

Principles of effective communication. Professional use of the English Language. Principles of technical writing. Types of technical report/ Technical Articles. Oral presentation of technical ideas.

EEE 321 ELECTRIC POWER SYSTEM PRINCIPLE II (2 CREDITS)

(Pre-requisite EEE 318 Electric Power System Principles 1)

Learning Outcomes

i. Know why the parameters of equipment and appliances of an electric power system are expressed in per unit systems and their benefits.
ii. Explain the basic concept of load flow studies and its benefits in planning an electric power system as well as the basic mathematical models and their applications of the load flow.
iii. Know the basic power system planning methods and when to apply each of them.
iv. Explain the effects of fault in an electric power system and the various types of these faults and the mathematical model of these types of faults.
v. Know the basic requirements for running different power plants simultaneously in a power grid and the benefits associated with running the plants in parallel using mathematical equations.
vi. Understand the basic concept of stability in an electric power system and the heading on which it is discussed and analysed.

Course Content

Representation of power system, power equation and analysis, load flow studies, load forecasting, economic operation of power system, symmetrical components, symmetrical and unsymmetrical faults, various protection system on power transmission lines. Principles of fault detection. Discrimination and clearance, element of power system stability.

EEE 322 ELECTROMAGNETIC FIELDS AND WAVES II (3 CREDITS)

(Pre-requisite: EEE 311 Electromagnetic Fields & Waves 1)

Learning Outcomes

i. Understand the electromagnetic power and energy relations as well as its practical applications.
ii. Apply the principles of magneto statics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
iii. Derive and explain Maxwell's equation in rectangular coordinates.
iv. Apply Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation.
v. Explain wave propagation mechanism in conductors and unbounded dielectric media.

Course Content

Review of Time Varying Fields: Maxwell's equations (in rectangular co-ordinates, integral form and differential form). Derivation of Maxwell's equations. Wave equation and its solutions. Plane waves in vacuum, lossy dielectric and conducting media. Pointing theorem, power and energy. Boundary conditions. Reflection and transmission of plane waves. Standing waves. Introduction to wave guides.

EEE 323 CIRCIUT THEORY II (2 CREDITS)

(Pre-requisite EEE 312 Circuit Theory 1)

Learning Outcomes

i. Analyse on-linear circuits using approximation methods.
ii. State the conditions for reliability of transfer functions.
iii. Design/synthesize RL, RC, LC and RLC circuits from given transfer functions.
iv. Design passive and active filters from transfer functions and performance specifications.

Course Content

Frequency domain analysis of networks: Networks functions; poles and zeros; frequency response curve; bode plots and Nyquist plots, signal classification; Fourier series and periodic signal; Fourier integral and non-periodic signals; Application of Fourier series in network analysis:
Laplace transforms application of Laplace transformation to transient analysis of RLC circuits.

Application to non-linear characteristics analysis and synthesis of non-linear resistance circuits, harmonics analysis of non-linear dynamic circuits, application of computers in the analysis of linear and non-linear circuits. Foster and Cauer's synthesis, active filters.

EEE 324 ELECTRONIC CIRCUIT 1 (3 CREDITS)

Learning Outcomes

i. Classify, describe and discuss the principles of operation and applications of FET and BJT.
ii. Calculate amplifier parameters.
iii. Design simple amplifiers using BJT and FET with given specifications.

Course Content

Semiconductor materials and devices. P-N junction diodes formation, characteristics, equation, rating and uses. Feedback, broadband and narrowband amplifiers, power amplifiers, voltage and current stabilizing circuits. Other types of diodes: Shocky diode, Zener diode, LED and Photodiodes. Single stage transistor Amplifier and operational Amplifiers. Bipolar transistors: Structure and operation, Biasing arrangement, circuit configuration of BJT, common base, common emitter and common collector configuration. Feedback, broadband and narrowband amplifiers, power amplifiers, voltage and current stabilizing circuits. Tyristors: Silicon controlled rectifiers (SCRs), Triacs and Diacs, their theory, operation, characteristics and application.

EEE 325 ELECTRONICS CIRCUIT LAB (1 CREDIT)

Learning Outcomes

i. Identify feedback and operational amplifiers.
ii. Understand the operation of basic logic and wave combinational circuits.
iii. Explain transistor characteristics.

Course Content

Feedback amplifier, operational amplifier, oscillator circuits, basic logic circuits, digital wave combinational logic circuits (Verification of Boolean Algebra Theorems) wave shaping circuits (monostable and astablemultivibrators) memory circuits and counters. Transistor characteristics (Junction and FET transistors), Zener diode characteristics and use of Zener diode as reference sources.

EEE 326 ADVANCED COMPUTER PROGRAMMING AND STATISTICS (3 CREDITS)

Learning Outcomes

i. Explain the elements of statistics.
ii. Describe the numerical iteration procedures.
iii. Develop a firm grasp of C++ programming in Engineering application.
iv. Acquire skills in computer aided design of electrical and electronic systems.

Course Contents

Elements of statistics. Distribution and experiments: Law of large number, numerical iteration procedures, Revision of C++ programming in Engineering Application programme in computer aided design of electrical and electronic systems.

EEE 327 MEASUREMENTAND INSTRUMENTATION (3 CREDITS)

Learning Outcomes

i. Analyse the performance characteristics of each instrument.
ii. Illustrate basic metres such as voltmetres and ammetres.
iii. Explain about different types of signal analysers.
iv. Explain the basic features of oscilloscope and different types of oscilloscopes.

v. Apply the complete knowledge of various electronics instruments/transducers to measure the physical quantities in the field of science, engineering and technology.

Course Contents
General instrumentation, basic meter in DC measurement. Basic meter in AC measurements, rectifiers voltmeter, electro-dynamometer and wattmeter. Instruments transformers, DC and AC Bridges. Universal Impendence Bridge. Electronic instruments for the measurement of voltage, current resistance and other circuit parameters; electronic voltmeters, AC voltmeters using rectifiers, electronics multimeters, oscilloscope, vertical deflection system, horizontal deflection system, probes, sampling CRO, instruments for generating and analyzing waveforms; square analyzers; electronic counters and their applications; Time base circuitry, universal counter measurement modes, analog and digital data acquisition system; tape recorders. D/A and A/D conversions, sample and hold circuits.

EEE 328 MEASUREMENTAND INSTRUMENTATION LAB (1CREDITS)

Learning Outcomes
i. Identify various measuring instruments and safety procedures in the Measurement and Control Lab.
ii. Conduct DC and AC measurements.
iii. Draw conclusions from computed and graphical analysis.
iv. Prepare and present experimental reports.

Course Content
Testing of indicating instruments; DC and AC measurements; Resistance with Bridges; Transducers Testing and output measurement; Capacitive and inductive transducers in FM systems, piezoelectric, photoelectric, thermocouples, cathode ray oscilloscope; study of features and operation, triggering, storage, measurement of voltage, current and phase difference; signal generator; study of features and output signal harmonic contents, frequency discrimination; Digital multimeters; features and operation details, measurement of voltage, current and resistance.

EEE 329 COMMUNICATION PRINCIPLES (3 CREDITS)

Learning Outcomes

i. Discuss communication models for analog and digital signals.

ii. Explain the basic time and frequency domain characteristics of signals.

iii. Describe the basic principles of analog and digital modulation.

iv. Be familiar with the general principles of wireless communication.

v. Explain the concept of noise and attenuation of signals in different transmission media.

Course Content

Communication Model, Analog and Digital Signals, Basic Time Domain and Frequency Domain characteristics, introduction to Modulation, Basic principles of Analog and Digital modulation, modulation types, characteristics; power and bandwidth requirements and performance. Transmission media: Attenuation and Noise in open space, air, cable and fiber channels; Multiplexing, types and characteristics; Introduction to wireless communications principles.

ENG 300 STUDENTS WORK EXPERIENCE II (1 CREDIT)

Learning Outcomes

i. Describe the process of designing and constructing engineering components and systems.
ii. Design and Construct a simple Electrical/Electronic system.
iii. Demonstrate proficiency in how to write engineering reports from lab work.
iv. Fill logbooks of all experience gained in their chosen careers

FOURTH YEAR

ENG 418: COMPUTATIONAL METHODS IN ENGINEERING (3 CREDITS)

Learning Outcomes
i. Improve in their knowledge and application of polynomials and their zeros and relate to system stability.
ii. Describe the principles and applications of different numerical methods.
iii. Discuss the various numerical methods applicable to Engineering problems.
iv. Explain the meaning and further enhance the essence of the eigenvalue problem.
v. Apply the principles of computational methods to the solution of Engineering Problems.
vi. Appreciate the various methods of solution of linear equations.

Course Content
Polynomials and their zeros: methods of bisection, Bairstow synthetic division and lahmer. Divert methods for the solution of linear equations. Convergence: interpolation and differentiation method in numerical integration Newton coates formulae and finite difference methods. The eigenvalue problem solution of ordinary differential equations. Methods of Taylor, Euler, Predictor – corrector and runge-Kutta.

EEE 411 ELECTRICAL MACHINES II (2 CREDITS)

(**Pre-requisite: EEE 313 Electrical Machines I**)
Learning Outcomes
i. Determine Transformer equivalent circuits and solve numerical problems for computation of losses and efficiency of Transformers.
ii. Explain the conditions for parallel operations of Transformers.
iii. Describe various methods of starting and speed control of induction motor.
iv. Draw and explain Power flow diagram of Induction motor.
v. Determine the synchronous impedance of Synchronous motor, and derive its Power and Torque equation.
vi. Explain voltage regulation, V-curves and parallel operation of Synchronous Generators.

Course Contents
Transformers: Core types and shapes, winding, cooling, in rush currents: harmonics in three phase transformer, saturables reactors. DC machines: review of excitation methods and performance characteristics: armature reaction, interlopes, compensation windings, ratings and efficiency; universal motor, permanent magnetic motor.

Induction motors: Three Phase Induction motor Winding, rotor types, circle diagram, rating, control methods, single phase induction motors – types and methods of starting, performance review and applications, synchronous linear induction motor. Synchronous machines; types – salient and cylindrical, circle diagrams and V-curves; synchronous generator on infinite busbar; parallel operation.

EEE 412 COMMUNICATION SYSTEM (3 CREDITS)

Learning Outcomes
i. Explain the concept of random processes and their parameters.
ii. Discuss the Hilbert transform and Markov processes and their application in digital systems.

iii. Discuss the different types of digital modulation techniques and their characteristic features, including spread spectrum.
iv. Carry out Logic circuit tests and distinguish between Synchronous and Asynchronous counters.
v. Apply Modulators and Demodulators in communications.

Course Content
Microwave frequencies and uses; microwave transmission in transmission lines and waves guides, microwave circuits; impendence transformation and matching, microwave circuits, passive microwave device, resonant and filter circuits, active microwave devices; Klystron and Magnetron tubes and semiconductors devices for microwave generation.
Antenna: Definitions of elementary parameters related to radiation patterns; dipole and overtone antenna and the related design parameters; introduction to antenna arrays. Radiowave propagation: Propagation in the ionosphere, troposphere and in stratified media; Principles of Scatter propagation; applications in general broadcast, television and satellite communication systems. Radar systems: nature of radar and radar equations; composition of a radar system; application of different types of radars.

EEE 413 DIGITAL ELECTRONICS (2 CREDITS)

Learning Outcomes
i. Discuss number systems and codes.
ii. Develop a good grasp of the Boolean algebra and De-Morgan's Theorems.
iii. Discuss the seven-segment LED displays.
iv. Solve complex problems in Binary addition.
v. Discuss various types and classifications of memories.

Course Content
Review of Flip-flops, counters and registers: Combining Logic Gates; constructing circuits from Boolean Expressions. Drawing a circuit from a Maxterm/Minterm Boolean Expression, Karnaugh maps, Computer Simulations – logic converter, programmable logic device (PLDs), DeMorgan's Theorems. Encoders, Seven-segment LED Displays, Decoder, BCD-to-Seven-segment Decoder/Drivers.Arithmetic Circuits: Binary Addition, half Adder, full Adders, IC Adders. Memories; Random Access Memories (RAM), Read-Only Memories (ROM), programmable Read-Only Memories (PROM), Non-volatile Read/Write Memory.

EEE 414 COMMUNICATION PRINCIPLES LAB. (1 CREDIT)

Learning Outcomes
i. Appreciate modulators and demodulators and their uses in communication circuits.
ii. Explain multiplexing techniques.
iii. Design D/A and A/D converters.
iv. Implement analog and digital telephony.

Course Content
Logic modules, Logic circuits, shift registers, shift counters, ring counters, single-latch and clocked filp-flops, JK flip flops, synchronous and Asynchronous counters, up-down counters, codes and code converters, D/A and A/D converters. Microcomputer interface techniques. Modulators and Demodulators (MODEM) and their uses in communication circuits. Multiplexing techniques, PAM and PCM circuits, analogue and digital telephony systems.

EEE 415 ELECTRONIC CIRCUIT II (3 CREDITS)
(Pre-requisite EEE 325 Electronic Circuit I)

Learning Outcomes
i. Classify, describe and discuss the various logic gates and flip-flops and multivibrators.

ii. Design simple logic and sequential circuits using logic gates and flip-flops.
iii. Design and modify electronic circuits using Karnaugh Maps.
iv. Discuss the applications of Flip-flops.

Course Content
Analysis and designs of multistage amplifiers. Feedback, broadband and narrow band amplifiers, power amplifiers, voltage and current stabilizing circuits, sinusoidal RC and LC and crystal oscillators, other communication circuits, review of elementary digital concepts, switching and waveshaping circuits. Generation of non-sinusoidal waveforms: astable, monostable and bistable multi-vibrators, co-operator, Schmitt trigger and time-base generators using discrete transistors, operational amplifier or other integrated circuits. Timer chips and their applications.
Analysis and design of logic gates of various families; diode logic, RTL, TTL, ECL, MOS and CMOS of digital integrated circuits.

Interfacing between various logic families, concept of small, medium, large and very large scale integration and their consequences, some digital building blocks; Flip-flops, counters register and decoders. Introduction to D/A and A/D conversion principles.

EEE 416 CONTROL SYSTEMS ENGINEERING I (2 CREDITS)

Learning Outcomes
i. Identify and describe various examples of control systems, and distinguish between open and closed-loop control systems.
ii. Describe and implement Operational Amplifiers (Op-Amps.
iii. Analyze control systems in time and frequency domains, and develop competence in the application of Laplace transform.
iv. Perform stability analysis using Routh, Bode and Nyquist stability criteria.
v. Use Matlab/Simulink in solving control systems problems.

Course Content
State space description of linear systems, concepts of controllability and observability, state feedback, model control observers, realization of system having specified transfer function, applications to circuit synthesis and signal processing.

EEE 417 CONTROL SYSTEMS LABORATORY (1 CREDIT)

Learning Outcomes
i. Perform time and frequency domain measurements of control system response.
ii. Demonstrate closed-loop control of a non-linear control system.
iii. Perform measurement of various speed control schemes of a dc motor.
iv. Illustrate analog, digital and hybrid control of servo motor position.

Course Content
Time and Frequency domain measurements of control system response, gain, lag and lead compensation of a closed loop servo system; closed loop control of a non-linear control system. Verification of describing function principles, observation of phase trajectories, performance measurement of proportional and proportional plus integral speed controlled DC motor; performance verification of analogue, hybrid and digital control of servo motor position.

EEE 418 DATA COMMUNICATIONS (2 CREDITS)

Learning Outcomes
i. Recognize the concept of data communication and network.
ii. Recognize the digital and the analog transmission technologies used for modern communication.
iii. Identify, deployment and differentiate among WDM and TDM and their alternatives.

iv. Role of Multiplexing in modern communication systems through data rate management.
v. Differentiate between OSI and TCP/IP models.

Course Content
Data communication – links; channels, media and configurations. Transmission over voice-grade circuits; design consideration. ITU recommendations, modulation techniques and modems interconnections and data encryption. Methods of enhancing channel capacity, packet – switching data networks. Multiplexing and synchronization techniques; organization of international and national digital networks requirements. Interfacing, protocols, information codes, error correction for data communication. Internet: Definition, Network Access points (NAPs). Internet access. Transmission control protocols/internet protocol (TCP/IP). Internet virtual private networking, IP addressing. Routers and Routing information Protocol (RIP). Routing Algorithms: shortest path routing e.g. OSPF, Distance vector routing. Link state routing, multi protocol label switching (MPLS). Next generation Ethernet: Wi Fi and wireless LANS, Wide Area Wireless Networks, Wimax and Broadband Access for data. WAN/LAN bridges and switches. Asynchronous Transfer Mode Network (ATM) structure.

EEE 410 SEMINAR AND INDUSTRIAL VISITS (1 CREDIT)

Learning Outcome
i. Hold intelligent discussions on the trends of research and engineering advancement.
ii. Explain the operation of an identified industry.
iii. Present technical reports in both oral and written format.

Course Content
This course is designed to allow discussion of projects, research and industrial related projects by both staff and students. By so doing, the students are exposed to the techniques of how to present scientific ideas and technical reporting. At the end of the course, students are expected to present their technical reports in both oral and written form.

GNT 411 Practicuum (2 Credits)
Learning Outcome
i. Produce any product of choice

EEE 400: SIWES – 15 CREDITS
Learning Outcomes
i. Be exposed and prepared for the Industrial work situation they are likely to meet after graduation, by developing their occupational competencies.
ii. Relate the classroom instructions and laboratory experience to real-life situations, including machines and equipment handling, professional work methods and ethics, human relations, key performance assessment methods, and ways of safeguarding the work environment – human and materials.
iii. Exposed to contacts for eventual job placements after graduation.
iv. Hone their technical reportage and presentation.

FINAL YEAR

EEE 511 ADVANCED CIRCUIT TECHNIQUES (3 CREDITS)

Learning Outcomes
i. Be able to design circuits that are implementable in industries.
ii. Solve industrial problems based on his design specifications.
iii. Be able to troubleshoot and make amends on pld designs to suit the present situation.

iv. Design and construct amplifiers, instrumentation amplifiers voltage controllers etc. For use in school laboratories.
v. Convert analogue design to digital one.

Course Content
Analysis and design of integrated operational amplifiers and advanced circuits such as wideband amplifiers, instrumentation amplifiers, multiplier circuits, voltage controlled oscillators and phase locked loops. Design techniques for advanced analogue circuits, containing transistors and operational amplifiers.

EEE 512 POWER ELECTRONICS AND DEVICES (3 CREDITS)

Learning Outcomes
i. Explain the principles of power control by switching, and demonstrate the benefits of switched mode circuits; be familiar with the commonly used semiconductor switching devices.
ii. Analyze and Demonstrate a full understanding on several DC-DC converters.
iii. Explain the operation principles for several thyristors-based rectifiers.
iv. Describe the H-bridge based inverters and their several control methods.
v. Apply Multisim or Workbench simulation software in solving Power Electronics problems.

Course Contents
Switching characteristics of diodes, transistors, thyristors, etc. analysis of diode circuit with reactive loads, analysis of circuits using transistors as switches, power control circuits, ac-dc converters, characteristics of switching transformers, power semi-conductor device protection, examples of power electronics circuits, solar devices.

EEE 513 ENGINEEIRNG LAW AND MANAGEMENT (2 CREDITS)

Learning Outcomes
i. Describe and explain the major differences between the various categories of law, courts and legal jurisdictions.
ii. Develop reasoned analysis of real-life or hypothetical engineering scenarios using the legal principles.
iii. Undertake critical analysis of reliable information to develop, and practically present technical reports for use in varying judicial/quasi-judicial settings including as an expert witness.
iv. Explain the managerial functions, and the principles and techniques for planning.
v. Discuss the techniques in engineering management.

Course Content
Engineering Profession: Professional ethics and conducts. Law: Definition and specifications, Applications of business law to engineering, patents and investigations, trademarks and copyright, contracts and contract documents. Engineering business types and structure and functions of organizations, professional problems, legal responsibilities, professional liability, role of energy in law suits.

Management: organization structure and behaviour, engineer to engineer manager transition, managerial functions, principles and techniques of planning, forecasting, organizing technical activities project selection and management leadership styles of leadership and management.
Technique in engineering management: Motivated, appraisal, participative and control techniques. Breakthrough and control management theory, personal management, labour and public relations. Wages and salary administration. Production and maintenance management, training, planning, organizing and controlling, motivating and appraisal of results.

EEE 514 TELECOMMUNICATION ENGINEERING (3 CREDITS)
Learning Outcomes
i. Describe the telecommunications standard and regulatory issues.
ii. Explain network planning and dimensioning to minimize data loss and delay.

iii. Discuss spectrum management, and explain radio planning, spectrum policy and allocation procedures at various levels.
iv. Discuss the role integrated data and environment in networks for optimum performance.

Course Content
Cable telegraphy and telephony characteristics, cross talk, equation, poleliness, aerial and underground cables. Telegraph system: codes, radio systems, terminal equipment (teleprinters, relays, switching systems, repeaters). Telephone receivers, switching (crossbar, electronic switches), PAX, PABX, Transmission standard, Telephone network structure.

EEE 515 MICROCOMPUTER HARDWARE AND SOFTWARE TECHNIQUES (3 CREDITS)

Learning Outcomes
i. Analyse and explain the basic building blocks of embedded systems hardware.
ii. Describe the hardware and software architecture of processors used in embedded systems.
iii. Develop experience in assembler and C programming languages.
iv. Build embedded system solutions with the help of common hardware interface units.

Course Content
Elements of digital computer design; control unit, micro-programming, bus organization and addressing schemes, micro-processors, system architecture, bus control, instruction execution and addressing modes, machine codes, assembly language and high-level language programming, micro-processors as state machines; microprocessor interfacing: input/output technique, interrupt systems and direct memory access; interfacing to analogue systems and applications to D/A and A/D converters. System development tools, simulators, EPROM Programming assemblers and loaders. Overview of an available microprocessor application.

EEE 516 MODELLING AND COMPUTER SIMULATION (2 CREDITS)

Learning Outcomes
i. Define system modelling.
ii. Classify and characterize models and State importance of system modelling.
iii. Identify various computer software packages in Electrical/Electronic Engineering.
iv. Build models and apply MATLAB/SIMULINK in solving practical problems in Electrical/Electronic Engineering.

Course Content
Introduction to system modelling Formation: System definition, classification of models, characteristics of models, Importance of mathematical models. Methodology: Defining and documenting the problem, analysis of data requirement, formulation of subsystems models, integration of subsystems, parameter estimation, debugging the simulator, validating and running the simulator. Introduction to MATLAB/SIMULINK Software. Practical applications: Curve fitting, Electrical networks, Transient Studies, Stability Studies (eigenvalue method).

EEE 517 ELECTRICAL MACHINE DESIGN (2 CREDITS)

(Pre-requisite EEE 411-Electrical Machines II)

Learning Outcomes
i. Explain fundamental concepts of heating and temperature effects on electrical devices.
ii. Describe the layout of A.C. and D.C. winding designs.
iii. Design different kinds of electrical machines theoretically.
iv. Apply computer simulation tools in the design of electrical machines for practical implementations.

Course Content

Electric machine construction: cables magnetic cores, insulating materials and their specification. Cooling: Heating and temperature rise data/curve and ventilation/cooling curves. Winding arrangements, flux flow and distribution in the cores for different windings. Flux wave approximations and calculations. Basic principles of electric machine design using machine output and dimensions. Design of inductors, transformers, dc machines, induction motor, synchronous machines: determination of machine core shapes and dimension, winding cable current rating. Insulation and cooling specifications for given output rating.

EEE 518 ELECTRIC POWER SYSTEM ANALYSIS, PLANNING AND PROTECTION (2 CREDITS)

(Pre-requisite EEE 321-Power Systems Principles II)

Learning Outcomes

i. Develop competence to model power system components.
ii. Analyse the condition of a power system through load flow and fault studies.
iii. Identify the key issues and techniques in power system planning.
iv. Explain the protection techniques and trends in power systems.

Course Content

Modelling of power systems Components. Load flow studies. Fault studies. Power system stability, load growth and forecasting, Introduction to power systems planning and operation using mathematical programming techniques. Protection: requirement, current and voltage level protection, time grading, and principles of simple differential protection schemes.

EEE 519 POWER SYSTEMS MODELING AND OPTIMIZATION (2 CREDITS)

Learning Outcomes

i. Identify the various components that make up electric power system.
ii. Develop mathematical models of power system components
iii. Explain the different characteristics and functions of these components.
iv. Use MATLAB/SIMULINK to model and analyze power system network.
v. Apply optimization techniques to power system operation and planning.

Course Content

Power system components functions, application and performance. Relative cost and sailing parameters, over-all planning problem considering present worth and cost benefit principles, system reliability, load forecasting. Non-linear programming; constrained and unconstrained minimization methods LaGrange multi-pillars, Kuhn – Tucker conditions, Linear, Quadratic and Integer Programming. Applications of optimization techniques to power system e.g. dispatch, optimal load shedding, Transmission Planning, etc. Application of MATLAB/SIMULINK to power system modelling.

EEE 500 FINAL YEAR PROJECT I and II (6 CREDITS)

Learning Outcomes

i. Conduct a research that would address known industrial, commercial, or domestic problems.
ii. Enhance competence in technical reporting and oral presentation.

EEE 520 INTRODUCTION TO VLSI TECHNOLOGY (2 CREDITS)

Learning Outcomes

i. Define Integrated Circuit and discuss its features, explain its evolution, manufacturing process.
ii. Explain the VLSI terminologies, and understand the VLSI technology.
iii. Explain the concept of hybrid micro century using strip-line, micro strip-line and photo etching. Understand and be able to explain the three key areas of GaAs crystal, diode, and IMPIATT developments.

iv. Explain the concepts of negative resistance devices, feedback circuits, impedance converters, active and crystal filters.
v. Explain the working principles and mode of operations of thick ICs active and passive substrate, thick and thin films ics and their current trends.

Course Content
Definition of Integrated circuits-small, large and very large scale integration. IC's and Development; manufacturing process, 3 types of LSI package, IC's and communications – data and PCH hybrids. Solid state hybrid review, micro components, microcircuits, transistance, semi-conductor elements, silicon and germanium crystals, junction, transistors diodes, digital substrate, thick IC's active substances, passive substrate, thick and thin films.IC's current trands.
Hybrid micro century – stripline, microstrip photo etching, three key areas of Development – GaAs Crystal, Ojun diode, IMDIATT et.Negative resistance devices, feedback circuits. Impedance converters, NIB. Active filters of crystal filters.

EEE 521 SOLID STATE ELECTRONICS – (3 CREDITS)
Learning Outcomes
i. Describe finite state machine and its applications in designing digital circuits.
ii. Build advanced digital logic circuits by applying various reduction techniques and schemes.
iii. Operate, debug, simulate and analyse complex digital designs in modern VHDL software.
iv. Analyse and synthesise digital circuits using commercially available VHDL software.
v. Create FPGA designs and implement state-of-the-art ASIC/FPGA design methodologies for computer-aided design of logic circuits.

Course Contents
Physics and property of Semi-conductor including high field effects. Carrier injection and semi-conductor surface phenomena, device technology, bulk and epitomical materials growth and impurity control, metal-semi-conductors interface properties, stability and methods of characterization; controlled and surface-controlled devices.

EEE 522 RELIABILITY AND MAINTAINABILITY OF ELECTRICAL/ELECTRONIC COMPONENTS AND SYSTEMS (2 CREDITS)

Learning Outcomes
i. Determine the reliability, maintainability and availability of electronic and electric power components using elementary statistics and probability theory.
ii. Explain the failure rate of electronics and electric power components.
iii. Show how mathematical models of system availability are constructed, and how system availability and reliability parameters can be estimated.
iv. Develop hardware and software availability enhancement and correct handling of fault after it is detected, so as to reduce downtime.

Course Content
Introduction to reliability, maintainability, availability. Elementary reliability theory. Application to power system and electronic components. Test characteristics of electrical and electronic components. Types of faults. Designing for higher reliability. Packaging, mounting, ventilation. Protection from humidity, dust.

EEE 523 INDUSTRIAL ELECTRONICS DESIGN (3 CREDITS)
Learning Outcomes
i. Explain basic elements of Industrial motor control and determine the use of different control devices and motor starters.
ii. Describe the application of solid state devices in circuits.

iii. Discuss the application of programmable controllers, thyristors, lasers, and fiber optics in the control of industrial processes.
iv. Explain the theory of robots and other motion control systems.

Course Contents
Characteristics and industrial applications of thyristors and other SCR devices. Transducers and their applications in sensing light, voltage, pressure, motion, current, temperature etc. mechanical relays, solid state relays, solid state relays and stepping motors. Real time control and remote control concepts in instrumentation. Micro-processor and micro-computer based systems.

EEE 524 DIGITAL SIGNAL PROCESSING (2 CREDITS)

Learning Outcomes
i. Specify the sampling, quantization, and signal conditioning requirements for a given DSP application.
ii. Identify components of a DSP hardware system and program a DSP processor in the C language Identify components of a DSP hardware system and program a DSP processor in the C language.
iii. Estimate spectra of discrete-time signals using the fast Fourier transform (FFT) in MATLAB and implement the FFT on a DSP chip.
iv. Design finite impulse response (FIR) and infinite impulse response (IIR) discrete-time filters for various frequency response applications.
v. Determine and interpret the z-domain transfer function of a discrete-time system and design discrete time filters in the z domain using the pole-zero method.
vi. Implement digital filter designs in MATLAB and on a DSP chip.
vii. Analyse discrete-time filter banks and multi-rate signal processing systems.

Course Content
Discrete signals and Z-transform, digital Fourier transform, fast Fourier transform. The approximation problem in network theory. Synthesis of low pass filters. Spectral transforms and their application in synthesis of high-pass and band pass filters. Digital filtering, digital transfer function aliasing, one-dimensional recursive and non-recursive filters. Computer techniques in filter synthesis. Realization of filters in hardware and software. Basic image processing concepts.

EEE 525 CONTROL SYSTEMS ENGINEERING II – (3 CREDITS)
(**Pre-Requisite EEE 416 Control Systems Engineering I**)

Learning Outcomes
i. Describe open and closed-loop systems.
ii. Explain and model linear systems in state space.
iii. Design lead and Lag compensations.
iv. Use Mason's Gain rule to compute transfer function for a signal flow graph.
v. Apply MATLAB/SIMULINK to solve control system problems.
vi. Distinguish between controllability and Observability of a system.

Course Content
State space description of linear systems, concepts of controllability and observability, state feedback, model control observers, realization of system having specified transfer function, applications to circuit synthesis and signal processing.

EEE 526 ELECTRIC MOTOR DRIVES (3 CREDITS)

(Pre-requisite EEE 411-Electrical Machines II)

Learning Outcomes
i. Describe basic converter/inverter-fed technologies of electric motors.
ii. Explain the drive quadrant concepts and motor operating cycles.

iii. Simulate and analyze the dynamic models of motor drive systems.
iv. Discuss fundamental issues on electric vehicles and its applications.
v. Apply MATLAB/SIMULINK in the modeling of Electric motor drives.

Course Content
DC Motor Control: Basic equations for armature voltage and field flux control of motor speed. Forward and reverse running, regenerative braking conditions; solid state dc motor control using controlled rectifiers and dc to dc choppers. Open loop and closed loop analysis of controlled separately excited dc motor. Three phase induction motor control. Basic speed torque control principles by pole changing, frequency and stator voltage variation; solid state induction motor, open loop drives using inverters, ac controllers, recovery schemes; closed loop control schemes by constant air gap. Flux control and slip frequency control; D-Q axis analysis of controlled induction motor. 3-phase synchronous motor control. Basic equations of armature voltage, frequency and rotor angle control of motor speed/torque. Inverter fed synchronous motor drive configurations, dynamic analysis of controlled 3-phase synchronous motors.

EEE 527 SWITCHGEAR AND HIGH VOLTAGE ENGINEERING (3 CREDITS)
Learning Outcomes
i. Describe the structures and operations of high voltage equipment.
ii. Show how to generate high a.c. and d. c. voltages.
iii. Explain the protection schemes and apparatus used to protect high voltage power system equipment.
iv. Explain overvoltage occurrences in power system – corona, and overvoltage due to switching, lightning
v. Deploy high voltage equipment to carry out tests on electric power apparatus and obtain the withstand voltage.

Course Content
Generation and measurement of high voltage and current; Breakdown theories for gaseous liquid and solid dielectrics, lightning phenomena, High voltage equipment, insulation co-ordination. Lighting protection, electric cables and condenser.

EEE528 POWER SYSTEM COMMUNICATION AND CONTROL (2 CREDITS)
Learning Outcomes
i. Describe substation major equipment and how reliable telecommunications affect their operations.
ii. Explain the purpose of system control and the different levels of control – generation control, transmission control.
iii. Explain power line communication and wireless technology principles.
iv. Describe control parameters and methods of control in power generation.
v. Model and analyze FACTs control devices and their optimal location within the power system.

Course Content
Review of transmission line theory. High frequency communication on power lines. Carrier systems and power line carrier applications. Multiplexing, Telemetering, Signal processing and data transmission. Control of power generation, voltage control, system stability, and automatic voltage regulators, regulating transformers.

EEE 529 ELECTRICAL SERVICE DESIGN (2 CREDITS)
Learning Outcomes
i. Discuss illumination laws compute Luminous flux and luminous intensity.
ii. Design lighting installation.
iii. Describe method of Earthing and testing of Electrical installation.
iv. Identify Energy audit instruments and carry out energy audit.
v. Describe adequate protection scheme

Course Content
Lighting installation, power installation, energy supply and distribution, choice of cables and conductors, wiring systems and accessories, outdoor low voltage lines and cables. Protection of low voltage installation and characteristics of low voltage equipment. Earthing and testing of electrical installation. Illumination.

SECTION 7
STAFF

The academic staff of the department are listed in Table 8.1, while the technical staff are listed in Table 8.2. The department also has administrative staff, and they are presented in Table 8.3.

Table 8.1: List Academic Staff of the Department

S/N	Name of Staff	Rank	Specialization
1	Engr. Prof. O. I. Okoro	Professor	Electrical Machines
2	Engr. Prof, L. I. Oborkhale	Professor	Communication
3	Engr. Prof. P. I. Obi	Professor	Electrical Power
4	Engr. Prof. J. A. Onah	Professor	Power Electronics
5	Engr. Dr. E. U. Udo.	Associate Professor	Electronics
6	Engr. Dr. Nnochiri Ifeoma	Associate Professor	Electronics
7	Engr. Dr. Chiagonye, Tochukwu	Associate Professor	Electronics
8	Engr. Dr. I. K. Onwuka	Senior Lecturer	Electrical Power Devices
9	Engr. Dr. C. C. Awah	Senior Lecturer	Electrical Machines
10	Engr. Dr. C. K. Okoro	Senior Lecturer	Control of Drives
12	Engr. Dr. G. C. Diyoke	Senior Lecturer	Power Electronics and New Energy Systems
13	Engr. Dr. C. A. Akwuroha	Senior Lecturer	Telecommunication
14	Engr. Dr. Mrs. H.U. Udeani	Senior Lecturer	Computer and control systems engineering
15	Engr. Dr, Iloh, Somtochukwu Francis	Senior Lecturer	Computer and control systems engineering
16	Engr Dr C. A. Okeke	Lecturer I	Communication and Control Engineering
17	Engr. Dr O. Oputa	Lecturer I	Power System Engineering

18	Engr. Dr A. O. Ekwe	Lecturer I	Communication Engineering
19	Engr. Dr C. Iroegbu	Lecturer I	Communication Engineering
20	Engr. Dr E. C. Abunike	Lecturer I	Machines and Drives
21	Engr. O. A. Nwaorgu	Lecturer I	Communication Engineering
22	Engr. Y. Omosun	Lecturer I	Communication Engineering
23	Engr. V.N. Irokwe	Lecturer I	Electrical Machines
24	Engr. K.C.N. Nwachukwu	Lecturer I	Electronics and Computer
25	Engr. Aguodoh Patrick	Lecturer I	Electronics
26	Engr. Dr. Ezeh, Chinenye Matthew-Emmanuel	Lecturer I	Electronics
27	Engr. Edeh, Cyril	Lecturer I	Electronics
28	Engr. Christopher Amadi	Lecturer I	Electronics
29	Engr. Enebe, Canice Chinonso	Lecturer II	Electronics
30	Engr. A.E. Amako	Lecturer II	Power systems

Table 8.2: List of Technical Staff

S/N	Name	Rank
1	Engr. R. U. Obasi	Chief Technologist
2	Mr. Ajayi, Ebenezer A.	Chief Technologist
3	Mr. Ifenkwe Clement	Senior Technologist
4	Mr. Madu Nnamaka	Senior Technologist
5	Engr. Nwaji, Ifeanyi K	Principal Technologist I
6	Engr. Olatunji, Ayodele A.	Principal Technical Officer I
7	Mr. Raphael Okere	Senior Technologist
8	Mr. Owora Chukwuemeka	Technologist I
9	Engr. Obasi Ogbonnaya	Technologist I
10	Mr. Jeffery,Matthew O.	Engineer I
11	Mr. Nwachukwu, James	Technologist I
12	Engr. Odo, Kingsley Onyeka	Engineer II
13	Mr. Okezie Ikwunagu	Senior Technical Officer
14	Mr. Idam, Ogbonnaya	Technologist I
15	Mr. Nebo Joshua	Higher Technical Officer

Table 8.3 List of Administrative Staff

S/N	Name	Rank
1.	Anthony Ikenna Olebara	Assistant Registrar
2.	Akudo Iheanacho	Assistant Registrar

3.		Administrative Assistant
4.	Nkechi Eme	Principal Executive Officer
5.	Esther Dennis Offia	Computer Operator II
6.	Ngozi Odonkor	Senior Clerical Officer