FEDERAL UNIVERSITY WUKARI, TARABA STATE, NIGERIA

DEPARTMENT OF COMPUTER ENGINEERING
FACULTY OF ENGINEERING

2021-2025

UNDERGRADUATE

STUDENT HANDBOOK

ADDRESS

Department's Name and Address

Department of Computer Engineering,
Faculty of Engineering,
Federal University Wukari,
KM 20 Kastina-Ala Road, PMB 1020,
Wukari, Taraba State, Nigeria.

University website: http://www.fuwukari.edu.ng

University email: fuw@fuwukari.edu.ng

Department email address: computerengineering@fuwukari.edu.ng

DISCLAIMER

The provisions in the Student Handbook do not constitute a contract, expressed or implied, between any student, or staff member and Federal University Wukari. The Federal University Wukari reserves the right to withdraw courses at any time, to change fees, calendars, curricula, admission procedures, and any other requirements affecting students. Changes will become effective whenever the proper authorities so determine and will also apply to prospective students. While every effort is made to ensure accurate and up-to-date information, the Federal University Wukari does not assume responsibility for any misrepresentation which might arise through error in the preparation of this or any other of its documents, or through failure to give notice of changes in its requirements, polices, tuition and fees, course offering, and other matters affecting students.

FOREWORD

The Department of Computer Engineering Student handbook is designed for Computer Engineering students of Federal University Wukari, included is students' entry and graduation requirement, academic standards and regulations, Programme Education Objectives (PEO), Programme outcomes (PO), Course Learning outcome (CLO), curriculum, course specification, and description, examination and staff of the Department.

The vision, mission, Programme Education Objectives (PEO), Programme outcomes (PO), and objectives of the Department will guide you in attaining the motto of this great university – Character, Excellence in your academic and school life.

This handbook does not constitute a contract between the Department of Computer Engineering and the student. The Department reserves the right to make changes in this handbook when necessary without notice.

On behalf of the Department, I welcome and wish you well in your studies in the University.

Engr. Dr. James Okpor MNSE. R.Engr. (COREN)
Ag. HOD

TABLE OF CONTENT

1.1 History

The Federal University Wukari (FUW) was founded in 2011 along with eight other Federal Government of Nigeria. The Faculty of Engineering at Federal University Wukari was established on 1st October 2013, a year after the university was founded by the Federal Government of Nigeria. Initially, it consisted of four departments: Chemical Engineering, Mechanical Engineering, Electrical/Electronic and Computer Engineering, and Civil Engineering. However, student enrolment was delayed due to the lack of resources and facilities. Eventually, on 16th June 2016, during a regular sitting of the university senate, it was decided to suspend the program due to its failure to commence activities since its inception. Four years later, in January 2021, the senate re-established the Faculty with three departments: Agricultural Engineering, Chemical Engineering, and Computer Engineering.

The Department of Computer Engineering was approved by the National Universities Commission to commence academic activities from 2020/2021 session, following NUC Resource Verification Exercise in 2020:

1.2 Vision

The vision of the Federal University Wukari is to be a leader among world class public universities by:

1. Advancing knowledge through high quality ICT centric educational experiences for students;
2. Encouraging entrepreneurship;
3. Conducting leading edge research and scholarship in all areas that promotes an intellectual environment that is anchored on the tenets of open dialogue and inquiry,
4. A deep and abiding appreciation of the entire spectrum of human experience.

1.3 Mission

The mission of the Federal University Wukari is to be a student's centered and community engaged institution by providing an enabling environment that:

1. Enhances intellectual growth, a strong commitment to academic excellence, integrity and entrepreneurship;
2. Creating new knowledge and using ICT and other enabling technologies to solve practical problems that benefit humanity;
3. Preparing our students as well as professionals in our community for ethical leadership;
4. Promoting service to community and enduring sense of global citizenship.

1.4 Philosophy

The Computer Engineering Programme is designed to prepare an engineer to work with all aspects of computers – not just software, not just hardware, but both. The software world includes high-level languages and complex programs, which are often required to solve problems. In the hardware world, designs also include many aspects of the physical world like temperature or noise, energy source and characteristics (particularly in our country still

witnessing equipment-damaging power surges) and often must include compromises between many opposing factors.The ability of a computer engineer to work in both worlds is what distinguishes himor her from a computer scientist (with little training with hardware) or an electrical engineer (with little training in software). Thus, the Computer Engineering Programme includes several courses in both Electrical and Electronic Engineering (such as circuits and electronics) and Computer Science (such as data structures andoperating systems). Graduates are expected to have a sound knowledge of the fundamentals in electrical or computer engineering that allows them to analyze and solve technical problems, to apply hardware and software tools to problem solution, and to create and evaluatetechnical products.

1.5 Objectives

The Computer Engineering programme is designed to provide practical and theoretical training on:

a. Artificial Intelligence (developing computers that simulate human learning and reasoning abilities)
b. Computer Architecture (designing new computer instruction sets, and combining electronic or optical components to yield powerful computing systems)
c. Computer Design and Engineering (designing new computer circuits, microchips, and other electronic computer components)
d. Computer Theory (investigating the fundamental theories of how computers solve problems, and applying the results to other areas of computer engineering)
e. Information Technology (developing and managing information systems thatsupport a business or other organization)
f. Operating Systems and Networks (developing the basic software computers use to supervise themselves or to communicate with other computers)
g. Robotics (designing computer-controlled robots for performing repetitiveindustrial tasks)
h. Software Applications (applying computing software to solve problems outside the computer field - in education or medicine, for example).
i. Software Engineering (generating computer programs)

1.6 Program Educational Objectives

The program educational objectives (PEO) describe what graduates are expected to attain within three to five years after of graduation, utilizing the knowledge gained from their academic program. The Program Educational Objectives for Department of Computer Engineering Federal University Wukari, Taraba State, Nigeria are to:

PEO1: Achieve successful careers in diverse fields of computer engineering that will provide the required services to government agencies, national and multinational companies.

PEO2: Assume positions of leadership and responsibility within an organization while adhering to the highest level of Engineering professional code of ethics.

PEO3: Advance their knowledge and skills through lifelong continuous professional development and postgraduate studies.

PEO4: Become an entrepreneur that deploy computer engineering and engineering related skills to solve problems that creates values and benefits humanities.

1.7 Programme Outcomes (PO)

By the time of graduation, students in the Computer Engineering Department, Federal University Wukari, Taraba State, Nigeria will have or demonstrate:

PO1. Engineering Knowledge: Ability to apply knowledge of mathematics, natural science, computing and engineering fundamentals to develop solutions to solve engineering problems

PO2. Problem Analysis: Ability to identify, formulate, research literature and analyse complex computer engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development

PO3. Design/Development of Solutions: Ability to 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

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

PO5. 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

PO6. The Engineer and Society: When solving complex engineering problems, analyze and evaluate sustainable development impacts to: society, the economy, sustainability, health and safety, legal frameworks, and the environment

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

PO8. Individual and 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

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: 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.

1.8 Staff of the Department

1.8.1 Academic Staff

S/N	NAME	RANK	QUALIFICATIONS	Phone Number
1	Engr. Dr. James Okpor	HOD	Dip. B.Eng., M.Eng., Ph.D, Computer Engineering (University of Benin)	07032504557
2	Engr. Dr Obinna Ugwu	Senior Lecturer	B.Eng Electrical and Electronic Engineering, M.Eng, Ph.D. Electrical Electronic and Telecommunication (Enugu State University of Science and Technology)	08068474572
3	Dr. Francis Emmanuel Chinda	Lecturer I	B.Eng. Electrical/Electronic Engineering (UNIMAID), M.Sc. Electronic Communication and Computer Engineering (Univ. of Nottingham), PhD RF and Microwave Engineering (Universiti Technologi PETRONAS)	07082575928
4	Engr. Dr. Olajide Blessing Olajide	Lecturer I	B.Tech. Computer Engineering (LAUTECH), PGD Education (NOUN), M.Tech., Computer Science (LAUTECH), Ph.D Computer Engineering (LAUTECH)	08136207643
5	Abubakar Audu	Lecturer II	B.Eng. Electrical Engineering Technology (North Carolina State University), M.Sc., Electrical Engineering (University of Nortern Iowa),	09068275586
6	Falade Mutiu Bolarinwa	Lecturer II	B.Eng. Electrical and Computer Engineering (FUTMINNA), M.Eng. Computer Engineering (FUOYE),	08060495390
7	Awudu Wunukhen Shehu	Lecturer II	B.Eng. Computer Engineering (UNIMAID), M.Eng. Computer Engineering (UNIUYO),	08060038185
8	Ibrahim Adamu Tasiu	Lecturer II	B.Eng. Electrical Engineering (BUK), M.Eng. Electronics & Control Engineering (SRM University India),	08033775011
9	Ibrahim Bako Abdulhamid	Lecturer II	B.Eng., M.Eng. Electrical Engineering (BUK)	07037738830

10	Engr. Okandeji, Monsuru Ade	Lecturer II	B.Sc., M.Sc. Electrical /Electronic Engineering (University of Ibadan)	08069514273
11	Murtala Ali Abdulahi	Graduate Assistant	B.Eng. Electrical Engineering (Kano Uni. Of Sci. & Tech)	07037738830
12	Yusuf Ayuba	Graduate Assistant	B.Eng. Computer Engineering (UNIMAID)	07038657038
13	Mohammed Hassan	Graduate Assistant	B.Eng Electrical and Electronics Engineering (Modibbo Adama Uni. of Tech.)	07067951213
14	Enyo-Ojo Atu Emmanuel	Graduate Assistant	B.Eng. Electrical /Electronic Engineering (University of Agriculture Makurdi)	07037141008

1.8.2 Administrative Staff

S/N	Name	Qualification	Rank
1.	Ibeh Nkeiruka	B.Sc.	Assistant Registrar
2.	Obegu Maria Zake	B.Sc.	Assistant Registrar
3.	Hoku M. Hannah	B.Sc	Higher Executive officer
4	Najeeb Zakari	M.Sc	Admin. Officer
5	Ubale Saidu Magaji	B.Sc	Higher Executive officer

2.0 Programme Nomenclature

Bachelor of Engineering (B. Eng) Degree in Computer Engineering

2.1 Duration of the Programme/Study and Unit Requirements

2.1.1 Duration of the Programme

The programme is for five years' duration for UTME candidates and four years for Direct Entry candidates

2.2.2 Unit Requirements

To obtain B. Eng (Hons) Computer Engineering, a student must have successfully complete approved courses to a minimum of 209 credits hours for UTME candidates and 174 credit hours for direct entry (DE) candidates including approved electives within the Department and from other related Departments. All the students must take and pass all stipulated General Studies courses. In addition, the students must go for industrial training (SIWES) for six (6) months at the end of first semester of the 4th year. Supervised research project must be carried out by students in the fifth year of study.

2.3 Admission Requirements

2.3.1 Admission into 100 Level

For admission into the 100 level, Candidates must possess a minimum of five (5) Ordinary Level credit passes in Mathematics, English Language, Physics, Chemistry and any other science subject in the West African Senior School Certificate Examination (WAEC), National

Examination Council (NECO), National Business and Technical Examination (NABTEB) or their equivalents.

A candidate for Computer Engineering discipline is also expected to have an acceptable score in Unified Tertiary Matriculation Examination (UTME). The UTME subjects shall be Mathematics, Physics, Chemistry and Use of English.

2.3.2 Admission into Direct Entry

For admission into 200 level, candidate must possess a minimum of five (5) Ordinary Level credit passes in Mathematics, English Language, Physics, Chemistry and any other science subject in the West African Senior School Certificate Examination (WAEC), National Examination Council (NECO), National Business and Technical Examination (NABTEB) or their equivalents. Candidates must have passes in Mathematics, Physics and Chemistry at GCE 'A' level or equivalent. The candidate must also be holders of ND and HND in any Engineering discipline at minimum of Upper Credit level to be eligible for consideration for admission into 200 and 300 levels respectively.

2.4 Registration Procedure

Every student shall normally complete course registration forms at the beginning of every session. Any addition or deletion from the course for which a student is formally registered must be made with the consent of the course coordinator.

A student may be allowed to withdraw from a course by the lecturer before a third lecture has been given. Such a student who withdraws after this time or fails to sit for examination without reasons acceptable to the Faculty board shall deemed to have failed the course. A grade point of zero shall be recorded for the student in the course. Late registration in the course may be allowed with penalty up to 4 weeks after the commencement of registration.

3.0 Programme Structure

The tables below show the courses according to the semesters with unit weight and status ;

100 LEVEL

First Semester 100 Level Computer Engineering

Course Code	Course Title	Units	Status
CHM101	General Chemistry I (Physical & Inorganic Chemistry)	3	Core
CHM107	Practical Chemistry I	1	Core
MTH101	General Mathematics I	3	Core
PHY101	General Physics I	3	Core
PHY103	General Physics III	2	Core
PHY107	Practical Physics I	1	Core
CSC101	Introduction to Computer Science	3	Core
GST101	Communication in English I	2	Core
GST107	Use of Library, Study Skills and Information Communication Technology (ICT)	2	Core
STA101	Introduction to Engineering Statistics	4	Core
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Second Semester 100 Level Computer Engineering

Course Code	Course Title	Credits	Units
CHM102	General Organic Chemistry	2	Core
CHM104	Inorganic Chemistry I	2	Core
CHM108	Practical Chemistry II	1	Core
MTH102	General Mathematics II	3	Core
MTH104	Elementary Vectors, Geometry and Mechanics	3	Core
PHY102	Electricity and Magnetism	3	Core
PHY108	Practical Physics II	1	Core
GST102	Communication in English II	2	Core
CSC104	Computer Programming I	2	Core
GST108	Communication in French	2	Elective
GST110	Communication in Arabic	2	Elective
		21	

A student must take **One (1**) electives in this semester

First Semester 200 Level Computer Engineering

Course Code	Course Title	Units	Status
CIE201	Strength of Materials I	3	Core
EEE203	Applied Electricity I	2	Core
EMA201	Engineering Mathematics I	3	Core
GEN201	Engineer in Society	1	Core
GEN203	Basic Engineering Laboratories I	2	Core
GST201	Philosophy, Logic and Human Existence	2	Core
GST203	Nigerian Peoples, Culture and Citizenship	2	Core
MEE203	Students Workshop Experience I	1	Core
MEE205	Applied Mechanics I	3	Core
MEE207	Engineering Materials	3	Core
MEE209	Engineering Drawing I	2	Core
		24	

Second Semester 200 Level Computer Engineering

Course Code	Course Title	Units	Status
EEE202	Applied Electricity II	2	Core
EMA202	Engineering Mathematics II	3	Core
GEN204	Basic Engineering Laboratories II	2	Core
GST204	History and Philosophy of Science	2	Core
GST206	Peace Studies and Conflict Resolutions	2	Core
MEE212	Engineering Drawing II	2	Core
MEE214	Fundamental of Fluid Mechanics	3	Core
MEE216	Applied Mechanics II	2	Core
MEE218	Engineering Thermodynamics I	3	Core
COE200	SWEP I	2	Core
COE202	Computer Engineering Concept	1	Core
		24	

300 LEVEL

First Semester 300 Level Computer Engineering

Course Code	Course Title	Units	Status
COE301	Computer Engineering Laboratory I	1	Core
EEE301	Circuit Theory I	3	Core
EEE303	Analogue Electronic Circuit	3	Core
EEE305	Measurement and Instrumentation	3	Core
EEE307	Electrical Machines	3	Core
EEE309	Digital Electronic Circuit	3	Core
EMA301	Engineering Mathematics III	3	Core
GEN301	Engineering Statistics	2	Core
GST301	Introduction to Entrepreneurship Studies	2	Core
		23	

Second Semester 300 Level Computer Engineering

Course Code	Course Title	Units	Status
COE302	Computer Engineering Laboratory II	2	Core
COE304	Software Development Techniques	3	Core
COE306	Programming Languages	2	Core
EEE304	Electromagnetic Fields and waves	3	Core
EEE306	Communication Principles	3	Core
EMA302	Engineering Mathematics IV	3	Core
GEN302	Engineering Communication	2	Core
GST302	Introduction to Entrepreneurial Skills	2	Core
COE300	SWEP II	2	Core
		22	

400 LEVEL

First Semester 400 Level Computer Engineering

Course Code	Course Title	Units	Status
COE401	Computer Engineering Laboratory	2	Core
COE403	Microprocessor System and Interfacing	3	Core
COE405	Computer Software Engineering	4	Core
COE407	Control System	3	Core
COE409	Prototyping Techniques	2	Core
COE411	Assembly Language Programming	3	Core
COE413	Computer Organization and Architecture	3	Core
GEN401	Engineering Economics	2	Core
		22	

Second Semester 400 Level Computer Engineering

Course Code	Course Title	Credits
COE400	SIWES	6

500 LEVEL

First Semester 500 Level Computer Engineering

Course Code	Course Title	Units	Status
GEN501	Engineering Management	3	Core
COE501	Computer Security Techniques I	3	Core
COE503	Artificial Neural Networks	3	Core
COE505	Reliability and Maintainability	3	Core
COE507	Cyperpreneurship and Cyber Law	2	Core
COE509	Data Communication and Network	3	Core
COE511	Microprogramming	2	Core
COE591	Project I	2	Core
COE513	Design and Installation of Electrical and ICT Services	2	Elective
COE515	Computer Security Techniques II	2	Elective
		23	

A student must take **One (1**) elective in this semester

Second Semester 500 Level Computer Engineering

Course Code	Course Title	Units	Status
GEN502	Engineering Law	2	Core
COE502	Digital Signal Processing	3	Core
COE504	Digital System Design with VHDL	3	Core
COE506	Computer Graphics and Animation	3	Core
COE508	Embedded system design	3	Core
COE592	Project II	4	Core
COE510	Digital Image Processing	2	Elective
COE512	Fuzzy Logic and Programming	2	Elective
COE514	Robotics and Automation	2	Elective
COE516	Cryptography Principles & Applications	2	Elective
		22	

A student must take **Two (2**) electives in this semester

Total credit required for graduation
PUTME = 209
Direct Entry = 174

COURSE SYNOPSIS

100-Level Courses First Semester

Students take most of these courses from the Faculty of Science, the General Studies and Entrepreneurial Unit, where they already exist in the university.

CHM101: General Chemistry I (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. define atom, molecules and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. rationalise the trends of atomic radii, ionization energies, electronegativity of the elements, based on their position in the periodic table;
5. identify and balance oxidation–reduction equation and solve redox titration problems;
6. draw shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using Le Chatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

Course Content

Atoms, molecules and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence Forces; Structure of solids. Chemical equations and stoichiometry; Chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM107: Practical Chemistry I (1 Unit)

Course Learning Outcomes

At the end of the course, the students should be able to:
1. state the general laboratory rules and safety procedures;
2. collect scientific data and correct carry out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. state the differences between primary and secondary standards;
5. perform redox titration;
6. record observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Content

Laboratory experiments designed to reflect the topics taught in CHM 101 and CHM 102 such as qualitative and quantitative chemical analyses, acid-base titrations. Gravimetric analysis. Calculation, data analysis and presentation. Functional group analysis.

MTH101 General Mathematics (Algebra and Trigonometry) (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:
1. define and explain set, subset, union, intersection, complements, and demonstrate the use of Venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;

4. identify various types of numbers; and
5. solve some problems using binomial theorem.

Course Content

Elementary set theory, subsets, union, intersection, complements, 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 rgand diagram. De-Moiré's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

PHY101 General Physics I (Mechanics, Thermal Physics and Waves) (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:
1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Content

Space and Time, Units and Dimension, Kinematics; Fundamental Laws of Mechanics, statics and dynamics; work and energy; Conservation laws. Moments and energy of rotation; simple harmonic motion; motion of simple systems; Elasticity; Hooke's law, Young's shear and bulk moduli, Hydrostatics; Pressure; buoyance, Archimedes' Principles; Surface tension; adhesion, cohesion, capillarity, drops and bubbles; Temperature; heat; gas laws; laws of thermodynamics; kinetic theory of gases; Sound. Types and properties of waves as applied to sound and light energies. Superposition of waves. Propagation of sound in gases, solids and liquids and their properties. The unified spectra analysis of waves. Applications.

PHY103 (Heat, Sound and Optics) (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:
1. explain the concepts of heat and temperature and relate the temperature scales;
2. define, derive and apply the fundamental thermodynamic relations to thermal systems;
3. describe and explain the first and second laws of thermodynamics, and the concept of entropy;
4. state the assumptions of the kinetic theory and apply techniques of describing macroscopic behaviour;
5. deduce the formalism of thermodynamics and apply it to simple systems in thermal equilibrium;
6. describe and determine the effect of forces and deformation of materials and surfaces.

Course Content

Temperature, thermometer, heat transfer and PVT surfaces, Kinetic theory, first and second laws of Thermodynamics. Transverse and longitudinal waves and standing waves. Intensity, beats and Doppler effect. Electromagnetic spectrum. Huygen's principle. Images formed by a single surface, thin lenses and aberrations. The eye, optical instrument, interference, single slit diffraction grating and polarization. Malus's law.

PHY107 Practical Physics I (1 Unit)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Content

At least six experiments from the following: use of measuring instruments, viscosity, surface tension, oscillation about an equilibrium position, Hooke's law, moment of inertia, focal length of lenses, refractive index, optical instruments, the sonometer, heat capacity, volume expansion and latent heat. potential difference and internal resistance of cells, use of potentiometer circuit; the metre bridge, simple current measuring instruments. Planck's constants and radioactivity.

CSC101 Introduction to Computer Science (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. explain basic components of computers and other computing devices;
2. describe the various applications of computers;
3. explain information processing and its roles in the society;
4. describe the Internet, its various applications and its impact;
5. explain the different areas of the computing discipline and its specializations; and
6. demonstrate practical skills on using computers and the internet.

Course Content

History of computers. Computer application in commercial and scientific environments, characteristics of computers, classification and types of computers, computer structure and its components. Introduction to software. Input/output peripheral devices, their advantages and disadvantages. Programming and information presentation. Basic instruction in computer, control programs. Transfer of control. Direct and indirect addressing. Instruction format. Translators, Loaders. Program compilation and execution; syntactic and lexical analysis. L30: T15:P0

STA101 Descriptive Statistics I (4 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. explain the basic concepts of descriptive statistics;
2. present data in graphs and charts;

3. differentiate between measures of location, dispersion and partition;
4. describe the basic concepts of Skewness and Kurtosis as well as their utility function in a given data set;
5. differentiate rates from ratio and how they are use; and
6. compute the different types of index number from a given data set and interpret the output.

Course Content

Statistical Data: their sources, collection and preliminary analysis by tables and graphs. Skewness and Kurtosis. Measure of central tendencies: Mean, weighted mean, standard deviation, mode, median and variance (grouped and ungrouped data). Time series and demographic measures and index numbers. Construction of questionnaires and simple index numbers. Use of random numbers and statistical tables. Inference: Estimation and test of hypothesis. Analysis and presentation of data. Curve fitting and goodness-of-fit tests. Regression and correlation of data.

GST101: Communication in English I (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:
1. identify possible sound patterns in English Language;
2. list notable language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Content

Effective communication and writing in English Language skills, essay writing skills (organization and logical presentation of ideas, grammar and style), comprehension, sentence construction, outlines and paragraphs.

GST107: Use of Library, Study Skills and ICT (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:
1. Define library education
2. Name library material and resources
3. Distinguish different library database resources
4. Describe modern ICT technologies available for library

Course Content

Brief history of libraries; Library and education; University libraries and other types of libraries; Study skills (reference services); Types of library materials, using library resources including e-learning, e-materials, etc.; Understanding library catalogues (card, OPAC, etc.) and classification; Copyright and its implications; Database resources; Bibliographic citations and referencing. Development of modern ICT; Hardware technology; Software technology; Input devices; Storage devices; Output devices; Communication and internet services; Word processing skills (typing, etc.).

100-Level Courses Second Semester

CHM102 Organic Chemistry (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. state rules guiding nomenclature and functional group classes of organic chemistry;
6. determine the rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

Course Content

Historical survey of the development and importance of organic chemistry; nomenclature and classes of organic compounds, Homologous series; Alkanes, and cycloalkanes, alkenes, alkynes; Functional groups; Benzene and aromacity; isolation, purification and identification of organic compounds.

CHM104 Inorganic Chemistry (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Identify units and measurements and relationship among them
2. Describe the state of matter
3. Explain gas and its properties
4. Explain chemical kinetics

Course Content

Units and measurement in physical chemistry. State of matter and change of state; Gases and their properties. Chemical equilibria; Thermochemistry; Introductory chemical kinetics; Acids, bases and salts; Redox reactions and redox potentials

CHM108: Practical Chemistry II (1 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. state the general laboratory rules and safety procedures;
2. collect scientific data and correctly carry out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which include ignition, boiling point, melting point, test on known and unknown organic compounds;
5. carry out solubility tests on known and unknown organic compounds;
6. carry out elemental tests on known and unknown compounds; and
7. carry out functional group/confirmatory test on known and unknown compounds which could be acidic/basic/neutral organic compounds.

Course Content

Continuation of laboratory experiments designed to reflect the topics taught in CHM 101 and CHM 102. Some of the experiments will have been carried out in CHM 107.

MTH102 General Mathematics II (Calculus) (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. identify the types of rules in differentiation and integration;
2. state the function of a real variable, graphs, limits and continuity;
3. solve some applications of definite integrals in areas and volumes;
4. solve function of a real variable, plot relevant graphs, identify limits and idea of continuity;
5. describe the derivative as limit of rate of change;
6. apply the techniques of differentiation and perform extreme curve sketching;
7. identify integration as an inverse of differentiation;
8. identify methods of integration and definite integrals; and
9. perform integration application to areas, volumes.

Course Content

Functions of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation, maxima and minima. Extreme curve sketching, integration, definite integrals, reduction formulae, application to areas, volumes (including approximate integration: Trapezium and Simpson's rule).

MTH103 Elementary Vectors, Geometry and Mechanics (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Illustrate vectors geometrically
2. Carryout operation on vectors such as integration and differentiation
3. Explain two-dimension coordinate geometry
4. Describe and solve problems regarding components of velocity and acceleration of moving objects
5. Describe force, moment, impulse and elasticity and solve problems using their knowledge

Course Content

Geometric representation of vectors in 1 -3 dimensions, components and direction cosines. Addition and scalar multiplication of vectors and linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two dimensional coordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola, tangent and normal. Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane. Force, momentum, law of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse, impact of two smooth spheres and asphere on a smooth surface.

PHY102 Electricity and Magnetism (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. determine electrostatic properties of simple charge distributions using Coulomb's law, Gauss's
law and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of AC voltages and currents in resistors, capacitors, and inductors.

Course Content

Coulomb's law. Gauss's theorem. Capacitors. Ohm's law. Kirchoff's laws, electrical energy, D.C. bridges and potentiometer. Magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometer. Multimeter, D. C. And A. C. Meters and generators. Hysteresis. Power in A. C. circuit, semiconductors, conductivity and mobility. Rectification.

PHY 108: General Practical Physics II (1Unit)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs;
5. draw conclusions from numerical and graphical analysis of data; and
6. prepare and present practical reports.

Course Content

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements, the treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction

GST102: Communication in English II (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Apply phonetics and lexicons to construct quality sentences in English language
2. Construct a logical paper for presentation in English language
3. Carry out public speaking and oral communication fluently in English language

Course Content

Logical presentation of papers; Phonetics; Instruction on lexis; Art of public speaking and oral communication; Figures of speech; Précis; Report writing.

GST108: Communication in French (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Identify and use numbers in French language
2. Identify and use alphabets in French language
3. Construct sentences in French language
4. Demonstrate comprehension of conversation in French language

Course Content

Introduction to French, Alphabets and numeracy for effective communication (written and oral), Conjugation and simple sentence construction based on communication approach, Sentence construction, Comprehension and reading of simple texts.

GST110: Basic Communication in Arabic (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Identify and use Arabic alphabets to form sentences
2. Identify and use numbers in Arabic for calculating
3. Apply the knowledge of Arabic to engage in conversational drills

Course Content

Introduction to Arabic alphabets and writing systems. Elementary conversational drills. Basic reading skills and sentence construction in Arabic.

CSC104: Computer Programming I (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Explain computer programs, computer language types and features
2. Solve problem using computer algorithms
3. Solve Computer Engineering problems using flowchart and pseudo-code
4. Apply BASIC and FORTRAN syntax to write programing
5. Solve given task using FORTRAN programming language

Course Content

Introduction to computers and programming. Problems solving on computer using algorithm, design using flowchart and pseudo-code. Introduction to high level programming languages, Basic and FORTRAN syntax, flow of control, input/output constructs, data types. Programming in FORTRAN. Extensive exercises in solving engineering problems using flowchart and pseudo-code.

200-Level Courses First Semester

CIE201: Strength of Materials (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Explain the equilibrium and stress strain relations
2. Describe torsion of circular members
3. Apply knowledge of bedding moments and bending stresses to solve practical problems
4. Describe elastic buckling of columns.

Course Content

Consideration of equilibrium; composite members, stress-strain relation. Generalized Hooke's law. Stresses and strains due to loading and temperature changes. Torsion of circular members. Shear force, bending moments and bending stresses in beams with symmetrical and combined loadings. Stress and strain transformation equations and Mohr's circle. Elastic buckling of columns.

EEE203: Applied Electricity (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. identify and discuss the fundamental concepts of electricity and electrical DC circuits;
2. recall and apply the basic DC circuit theorems to solve problems ;
3. demonstrate the understanding of basic AC circuit theory to solve problems
4. use the knowledge of inductance, impedance, Resistance and Capacitance to solve of simple circuits problems.

Course Content

Fundamental concepts - Electric fields, charges, magnetic fields. current, B - H curves Kirchhoff's laws, superposition. Thevenin, Norton theorems, Reciprocity, RL, RC, RLC circuits. DC, AC bridges, Resistance, Capacitance, Inductance measurement, Transducers, Single phase circuits, Complex J - notion, AC circuits, impedance, admittance, susceptance.

EMA201: Engineering Mathematics I (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. apply vector and matrix analyses such as linear independence and dependence of vectors, rank to solve qualitative problems.
2. describe the concepts of limit theory and n'th order differential equations and their applications to physical phenomena;
3. solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables;
4. describe the applications of double and triple integration in finding the area and volume of engineering solids, and explain the qualitative applications of Gauss, Stoke's and Green's theorem;
5. explain ordinary differential equations and applications, and develop a mathematical model of linear differential equations, as well as appreciate the necessary and sufficient conditions for total differential equations; and
6. analyze basic engineering models through partial differential equations such as wave equation, heat conduction equation, etc., as well as fourier series, initial conditions and its applications to different engineering processes.

Course Content

Limits, Continuity, differentiation, introduction to linear first order differential equations, partial and total derivatives, composite functions, matrices and determinants, Vector algebra, Vector calculus, Directional Derivatives.

GEN201: Engineering in Society (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Define the philosophy of Science and Engineering
2. Explain the operations and conducts of engineering bodies and societies
3. Discuss the roles of Engineers in nation building
4. State the safety measures and ethics for engineering practice
5. Carry out risk analysis on simple engineering project

Course Content

Philosophy of Science and Engineering. History of Engineering and Technology. The Engineering profession – Engineering literacy professional bodies and engineering societies. Engineers' code of conduct and ethics. Engineers and nation building - economy, politics, business, safety in Engineering and introduction in Risk analysis, invited lecturers from professionals.

GEN 203 Basic Engineering Laboratory I (1 Unit)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Carry out selected experiment in Thermodynamics
2. Carry out selected experiment in Applied Mechanics
3. Carryout selected experiments in Fluid Mechanics
4. Describe and explain their observations and results of experiments in log books and reports as applicable

Course Content

Laboratory investigation and report submission for selected experiments and projects in Thermodynamics, Applied Mechanics and Applied Electricity and Fundamentals of Fluid Mechanics.

MEE 203: Students Work Shop Experience (2 Units)

Course Learning Outcomes

At the end of this course, the students should be able to:

1. identify various basic hand and machine tools, analogue and digital measurement devices and instruments, and acquire skills in their effective use and maintenance;

2. practically apply basic engineering technologies, including metrology, casting, metal forming and joining, materials removal, machine tooling (classification, cutting tool action, cutting forces, non-cutting production) and CNC machining technology;

3. apply workshop and industrial safety practices, accident prevention and ergonomics;

4. identify and select different electrical and electronic components like resistances, inductances, capacitances, diodes, transistors and their ratings for circuit construction;

5. construct electric circuits, understand different wiring schemes, and check ratings of common household electrical appliances and their basic maintenance; and
6. differentiate household and industrial energy consumption, and understand practical energy conservation measures.

Course Content

Introduction to practices and skills in general engineering through instruction in operation of hand and powered tools for wood and metal cutting and fabrication. Supervised hands - on experience in safe usage of tools and machines for selected tasks.

MEE 205: **Applied Mechanics I (3 Units)**

Course Learning Outcomes

At the end of this course, the students should be able to:

1. Design simple machine using the principle of force, moment and couples
2. Illustrate and solve equilibrium problems
3. Use newton's law of motion to solve problems
4. Carryout out analysis on energy and momentum problems
5. Paraphrase the kinematics of particles
6. Describe rigid bodies in plane motions

Course Content

Forces, moments, couples. Equilibrium of simple structures and machine parts. Friction. First and second moments of area; centroids. Kinematics of particles and rigid bodies in plane motion. Newton's laws of motion. Kinetic energy and momentum analyses.

MEE 207: Engineering Materials (3 Units)

Course Learning Outcomes

At the end of this course, the students should be able to:

1. demonstrate the role of atoms and molecules (aggregates of atoms) in the building of solid/condensed matter known as engineering materials, the electron quantum numbers and how the electrons are arranged in different atomic elements, and explain the role of electronic configuration and valence electrons in bonding;
2. define metals, alloys and metalloids, demonstrate mental picture of the solid mineral resources development as a relay race among four 'athletes': geologist, mining engineer, mineral processing technologist, process metallurgical engineer, and classify metallurgical engineering into 3Ps: process, physical and production;
3. explain the relationship between structure and properties of materials, characteristics, components and compositions of phase diagrams and phase transformations of solid solutions;
4. define ceramics, glass and constituents of glasses and understand application of ceramics in mining, building, art and craft industries;
5. define and compare polymers as a class of engineering materials and polymeric materials, demonstrate polymerisation reactions, their types and mechanism, and applications of polymers;
6. discuss the properties, types and application of composite materials and fibres (synthetic and natural);
7. define and classify nanomaterials, demonstrate applications of nanomaterials, concept,

design and classification of fracture mechanics, corrosion classification, including the five principal ways of controlling corrosion and metal finishing processes such as sherardising, galvanising and anodising; and
8. identify and state the factors affecting the performance and service life of engineering materials/metals and metallography of metals/materials (materials anatomy), which enables metallurgical and materials engineers to prescribe appropriate solutions to test metals/materials fitness in service through structure-property-application relationships.

Course Content

Introduction to electronic configuration, atomic structures, inter-atomic bonding mechanisms, crystal and microstructure. Relationships between structure and properties of metals, alloys, ceramics and plastics. Principles of the behaviour of materials in common environments. Fabrication processes and applications.

MEE 209: Engineering Drawing I (2 Units)

Course Learning Outcomes

At the end of this course, the students should be able to:

1. carryout transfer of lettering
2. illustrate dimensioning, orthographic projection
3. illustrate auxiliary and mechanical sectional view
4. carryout simple architectural drawing

Course Content

Transfer of lettering, dimensioning, orthographic projection, auxiliary and mechanical sectional view, true lengths, graphical calculus and architectural drawings.

200-Level Courses Second Semester

EEE 202: **Applied Electricity II (3 Units)**

Course Learning Outcomes

At the end of this course, the students should be able to:

1. illustrate basic DC machines
2. explain alternators and transformers
3. discuss transistors, thyristors, Zener and rectifier
4. discriminate basic control systems
5. describe basic communication technology such as TV, Radio and Telephone

Course Content

Basic machines - DC, synchronous alternators, transformers, equivalent circuits. Three phase balanced circuits, PN junction Diode, Transistors, Thyristors FETs, Zener, Rectifiers. Basic control systems, open/closed loop systems. Communications fundamentals, introduction of TV, Radio, Telephone systems.

EMA 202: Engineering Mathematics II (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:
1. describe physical systems using ordinary differential equations (ODEs);

2. outline the practical importance of solving ODEs, solution methods, and analytically solve a wide range of ODEs, including linear constant coefficient types;
3. numerically solve differential equations using MATLAB and other emerging applications;
4. perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion, as well as on functions of several variables, including directional derivatives and multiple integrals;
5. solve problems using the fundamental theorem of line integrals, Green's theorem, the divergence theorem, and Stokes' theorem, and perform operations with complex numbers;
6. 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; and
7. evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.

Course Content

Second order differential equations, line integral, multiple integral and their applications, differentiation of integral. Analytical functions of complex variables. Transformation and mapping. special functions.

MEE 212: Engineering Drawing II (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. illustrate advance auxiliary and sectional view exercise on drawing papers
2. carry out illustration of isometric projection on drawing papers
3. prepare and design simple computer aided graphics
4. generate blueprint reading

Course Content

Advanced topics in auxiliary and sectional views, development, and intersection of surfaces, isometric projection, dimensioning and tolerances. Introduction to computer aided graphics. Blue-print reading.

MEE 214: Fundamentals of Fluid Mechanics (3 Units)

Course Learning Outcomes

At the end of this course, the students should be able to
1. explain the properties of fluids;
2. evaluate forces in static fluids and fluids in motion;
3. assess whether a floating body will be stable;
4. discuss the effect of various instruments, (valves, orifices, bends and elbows) on fluid flow in pipes;
5. measure flow parameters with venturi meters, orifice meters, weirs;
6. apply principles of mass, momentum and energy conservation to perform calculations;
7. perform dimensional analysis and simple fluid modelling problems; and
8. select the type and capacity of pumps and turbines for engineering applications.

Course Content

Properties of fluids, Fluids statics, Basic conservation laws, friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamic similitude, principles of construction and operation of selected hydraulic machinery. Hydropower systems.

MEE 216: Applied Mechanics II (2 Credits)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. apply Hooke's law under loading and temperature changes.
2. Discuss deflection of beans
3. Explain moments and force
4. Describe analytical methods for structure

Course Content

Hooke's law: stresses and strain due to loading and temperature changes. Torsion. Stress circle. Deflection of beams with symmetrical and combined loadings. Elastic buckling of columns, Shear forces and bending moments. Analytical methods for structures.

MEE 218: Engineering Thermodynamics I (3 Units)

Course Learning Outcomes

At the end of this course, the students should be able to:

1. describe basic concepts of thermodynamics, quantitative relations of Zeroth, first, second and third laws;
2. define and explain system (surrounding, closed and open system), control volume and control mass, extensive and intensive properties;
3. calculate absolute and gage pressure, and absolute temperature, calculate changes in kinetic, potential, enthalpy and internal energy;
4. evaluate the properties of pure substances i.e. evaluate the state of the pure substances such as compressed liquid, saturated liquid-vapour mixture and superheated vapour using property diagrams and tables; arrange the ideal and real gas equations of state,
5. formulate the first law of thermodynamics for a closed system i.e. organize the change in energy in the closed systems via heat and work transfer;
6. distinguish heat transfer by conduction, convection and radiation, and calculate the amount of heat energy transferred;
7. calculate the changes in moving boundary work, spring work, electrical work and shaft work in closed systems;
8. apply the first law of thermodynamics for closed systems and construct conservation of mass and energy equations;
9. formulate the first law of thermodynamics to the open systems i.e. describe steady-flow open system, apply the first law of thermodynamics to the nozzles, diffusers, turbines, compressors, throttling valves, mixing chambers, heat exchangers, pipe and duct flow;
10. construct energy and mass balance for unsteady-flow processes;
11. evaluate thermodynamic applications using second law of thermodynamics;
12. calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat pumps; and
13. restate perpetual-motion machines, reversible and irreversible processes.

Course Content

Basic concepts, definitions and laws (quantitative relations of Zeroth, first, second and third laws of thermodynamics). Properties of pure substances: the two-property rule (P-V-T behaviour of pure substances and perfect gases); state diagrams. The principle of corresponding state; compressibility relations; reduced pressure; reduced volume; temperature; pseudo-critical constants. The ideal gas: specific heat, polytropic processes. Ideal gas cycles; Carnot; thermodynamic cycles, turbines, steam and gas, refrigeration. The first law of thermodynamics – heat and work, applications to open and closed systems. The steady flow energy equation (Bernoulli's equation) and application. Second law of thermodynamics, heat cycles and efficiencies.

GEN 204 Basic Engineering Laboratory II (1 Unit)

Continuation of GEN 203

COE 200 SWEP (2 units)

Course Learning Outcomes

At the end of this course, the students should be able to:

1. demonstrate industrial workplace perceptions, ethics, health and safety consciousness, inter-personal skills and technical capabilities needed to give them a sound engineering foundation;
2. apply basic engineering techniques and processes applicable to their specializations;
3. design and construct machines, devices, structures or facilities relevant to their specific engineering programmes and applications; and
4. demonstrate good technical report documentation (log-book) and presentation of their practical experiences.

Course Content

On the job experience in industry chosen for practical working experience but not necessarily limited to the student's major (8 weeks during the long vacation following 200 level).

GST201: Logic, Philosophy and Human Existence (2 Credits)

Course Learning Outcomes

At the end of the course, students should be able to:

1. identify the basic features of philosophy as an academic discipline;
2. outline the main branches of philosophy and the centrality of logic in philosophical discourse;
3. explain and apply the elementary rules of reasoning to solve problems;
4. distinguish between valid and invalid arguments;
5. evaluate critically and assess arguments in texts, conversations and day-to-day discussions;
6. contrast the rationality or otherwise of human conduct under different existential conditions;

Course Content

A brief survey of the main branches of Philosophy; Symbolic logic; Special symbols in symbolic logic-conjunction, negation, affirmation, disjunction, equivalent and conditional statements, law of tort. The method of deduction using rules of inference and bi-conditionals, qualification theory. Types of discourse, nature or arguments, validity and soundness,

techniques for evaluating arguments, distinction between inductive and deductive inferences; etc. (Illustrations will be taken from familiar texts, including literature materials, novels, law reports and newspaper publications).

GST203: Nigerian Peoples and Culture (2 unit)

Course Learning Outcomes

At the end of this course, students should be able to:

1. analyse the historical foundation of Nigerian cultures and arts in pre-colonial times;
2. identify and list the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political entity;
4. analyse the concepts of trade and economic self-reliance of Nigerian peoples in relation to national development;
5. enumerate the challenges of the Nigerian state regarding nation building;
6. analyse the role of the judiciary in upholding fundamental human rights
7. identify the acceptable norms and values of the major ethnic groups in Nigeria; and
8. state possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Content

Study of Nigerian history, culture and arts in pre-colonial times; Nigerian's perception of his world; Culture areas of Nigeria and their characteristics; Evolution of Nigeria as a political unit; Indigene/settler phenomenon; Concepts of trade; Economic self-reliance; Social justice; Individual and national development; Norms and values; Negative attitudes and conducts (cultism and related vices); e-orientation of moral; Environmental problems.

GST206: Peace and Conflict resolution (2 Credits)

Course Learning Outcomes

At the end of this Course, students should be able to:

1. discriminate the concepts of peace, conflict and security;
2. categorise major forms, types and root causes of conflict and violence;
3. differentiate between conflict and terrorism;
4. explain security and peace building strategies; and
5. describe the roles of international organizations, media and traditional institutions in peace building.

Course Content

Basic Concepts in peace studies and conflict resolution; Peace as vehicle of unity and development; Conflict issues; Types of conflict, e. g. Ethnic/religious/political/ economic conflicts; Root causes of conflicts and violence in Africa; Indigene/settler phenomenon; Peace – building; Management of conflict and security. Elements of peace studies and conflict resolution; Developing a culture of peace; Peace mediation and peace-keeping; Alternative Dispute Resolution (ADR). Dialogue/arbitration in conflict resolution; Role of international organizations in conflict resolution, e.g. ECOWAS, African Union, United Nations, etc.

COE202 Computer Engineering Concept (2 Units)

Course Learning Outcomes

At the end of the course the student should be able to:

1. explain the profession of computer engineering;

2. discuss roles played by computer engineers; and
3. explain the historical development of computers.

Course Content

Historical development of modern computing and computer engineering profession; roles and responsibilities of the computer engineer; career paths and development (public and private sectors, academic/research and industry); overview of computer engineering design; computer devices/hardware in the age of‘ smartness’ and Internet of Things and People ‘IoTs and P’; identification of computer software and hardware components and operational relationships (central processing units, input/output devices, operating systems, languages,

300 Level First Semester

COE 301 COMPUTER ENGINEERING LABORATORY I (1 UNITS)

Course Learning Outcomes

At the end of the course the student should be able to:

1. Carryout selected experiment from Introduction to Electrical Engineering Course
2. Carryout selected experiment from Applied Mechanics Course
3. Carryout selected experiment from Applied Computer Programming I Course
4. Carryout selected experiment from Engineering workshop Course

Course Content

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

EEE301: CIRCUIT THEORY I (3UNITS)

Course Learning Outcomes

At the end of the course the student should be able to:

1. Use network theorems to carry out network analysis
2. Explain various concepts regarding RL, RC and RLC circuit
3. Analyze network graph and topologies
4. Describe application of computer to linear and non-linear circuits

Course Content

Network analysis: network theorems, mesh and nodal analysis. One- and two-port networks: driving point functions, circuit parameters, interconnection, transformation and termination. Transient and steady state response of circuits: RL, RC, RLC circuits, free and forced oscillations. Foster and Cauer’s methods of synthesis, 2-port network synthesis, active filters. Network graphs and topology: basic concepts, applications to non-planner networks. Applications of computers in the analysis of linear and non-linear circuits.

EEE303: ANALOGUE ELECTRONIC CIRCUIT (2 UNITS)

Course Learning Outcomes

At the end of the study, the student should be able to:

1. explain the basics of semiconductor devices and their applications in different

areas;
2. describe different biasing techniques to operate transistor, FET, MOSFET and operational amplifier in different modes; and
3. analyze output in different operating modes of different semiconductor devices.
4. describe amplifiers

Course Content

Review of single-stage transistor amplifiers using BJTS and EETs Equivalent circuit and calculation of current gain, voltage gain, power gain, input and output impedance. Operational Amplifiers: Parameters and applications. Feedback, Broadband and narrowed band amplifies. Power amplifiers. Voltage and current stabilizing circuit. Voltage amplifiers, multi storage amplifier. Using BJTs and FETs.

EEE305: MEASUREMENTS AND INSTRUMENTATION (3 UNITS)

Course Learning Outcomes

At the end of the course the student should be able to:
1. evaluate the performance characteristics of each instrument;
2. use basic meters such as voltmeters and ammeters;
3. explain different types of signal analyzers;
4. describe the basic features of oscilloscope and different types of oscilloscopes; and
5. apply the complete knowledge of various electronics instruments/transducers to measure the physical quantities in the field of science, engineering and technology.

Course Content

General Instrumentation, Basic Meter in DC measurement. Basic meter in AC measurements; rectifier voltmeter, electro-dynamometer and Wattmeter, instrument transformers; DC and AC bridges and their applications; general form of AC bridge universal impendance bridge; Electronic instruments for the measurement of voltage, current resistance and other circuit parameter, electronic voltmeters, AC voltmeters using rectifiers, electronic multimeter, digital volumeters; oscilloscope: vertical deflection system, horizontal deflection system, probes, sampling CRO, Instruments for generating and analyzing waveforms; square-wave and pulse generator, signal generators, function generators, wave analyzers, Electronic counters and their applications: time base circuitry, universal counter measurement modes; Analog and digital data acquisition systems: tape recorders, D/A and A/D conversions, sample and hold circuits.

EEE307: ELECTRICAL MACHINES (2 UNITS)

Course Learning Outcome

At the end of the course the student should be able to:
1. Solve electromechanical energy conversion
2. Describe magnetic field, inductance and DC control machines
3. Evaluate the performance of synchronous machines and generators
4. Explain operation and protections of machines

Course content

Review of electromechanical energy conversion, rotating magnetic fields, performance and methods of speed control of DC machines, induction motors, linear induction motors, circle diagrams, power transformers, parallel operation of 3-phase transformers. Performance of

synchronous machines, parallel operation of synchronous generators, fractional horse-power motors, single-phase induction motors, universal motors. Reluctance motors, hysteresis motors. Faults on machines, methods of starting and protection of machine

EEE309: Digital Electronics Circuit (2 Units)

Course Learning Outcome

At the end of the course the student should be able to:

1. classify, describe and discuss the various logic gates and flip-flops and multivibrators;
2. design simple logic and sequential circuits using logic gates and flip-flops.
3. discuss the applications of counters, registers and timers
4. describe ADC and DAC

Course content

Number Systems and Codes. Logic Gate Simplification of Logic expressions using Boolean Algebra. Simplification of Logic expressions using Karnaugh Method. Design combinational circuit. Flip-Flops. Application of Flip-Flops in thedesign of counters, registers and timers. Switching and Waves shipping circuit. Generation of non-sinusoidal signal (multi vibrators). Introduction to ADC and DAC. Design of Logic Gates (Diode, DTL, TTL, ECL etc)

EMA301: Engineering Mathematics III (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. solve linear algebra problems
2. solve problems in advanced mathematical topics such as matrices, linear equations;
3. carry out Coordinate Transformation, Solid Geometry, Polar, Cylindrical and Spherical Coordinates calculations;
4. evaluate double integral, triple integral and gradient of scalar quantities.
5. illustrate theorems regarding multivalued functions, analytical functions and Cauchy Reimann's equations

Course Content

Linear Algebra. Elements of Matrices, Determinants, Inverses of Matrices, Theory of Linear Equations, Eigen Values and Eigen Vectors. Analytical Geometry, Coordinate Transformation, Solid Geometry, Polar, Cylindrical and Spherical Coordinates. Elements of Functions of Several Variables, Surface Variables. Ordinary Integrals, Evaluation of Double Integrals, Triple Integrals, Line Integrals and Surface Integrals. Derivation and Integrals of Vectors, The Gradient of Scalar quantities. Flux of Vectors, The Curl of a Vector Field, Gauss, Greens and Stoke's Theorems and Applications. Singular Valued Functions. Multivalued Functions, Analytical Functions, Cauchy Riemann's Equations. Singularities and Zeroes, Contour Integration including the use of Cauchy's Integral Theorems, Bilinear Transformation.

GEN301: Engineering Statistics and Data Analytics (3 Units C: LH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. apply descriptive statistics to datasets from point of view of knowledge convergence, machine learning, and intelligence augmentation

2. carryout analysis using Probability, Binomial, poison hyper-geometric, normal distributions
3. construct appropriate graphical displays of data and highlight the roles of such displays in data analysis, particularly the use of statistical software packages;
4. discuss big data analysis and cloud computing
5. carry out analysis using R programming

Course Content

Descriptive statistics, frequency distribution, populations and sample, central tendency, variance data sampling, mean, median, mode, mean deviation, percentiles, etc. Probability. Binomial, poison hyper-geometric, normal distributions, etc. Statistical inference intervals, test hypothesis and significance. Regression and correlation. Introduction to big data analytics and cloud computing applications. Introduction to the R language; R as a calculator; Vectors, matrices, factors, data frames and other R collections. Iteration and looping control structures. Conditionals and other controls. Designing, using and extending functions. The Apply Family. Statistical modelling and inference in R.

GST 301: Introduction to Entrepreneurship (2 Units:)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Define entrepreneurship
2. Describe theories of entrepreneurship practice
3. Illustrate financial planning and management
4. Describe legal issues about a business
5. Give examples of business opportunities in Nigeria.

Course Content

Introduction to entrepreneurship and new venture creation; Entrepreneurship in theory and practice; The opportunity, Forms of business, Staffing, Marketing and the new venture; Determining capital requirements, Raising capital; Financial planning and management; Starting a new business, Feasibility studies; Innovation; Legal Issues; Insurance and environmentalconsiderations. Possible business opportunities in Nigeria.

300 Level Second Semester

COE304 Software Development Techniques (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Define and identify software developmental cycle
2. Sove practical problems using pseudo-code/ flowchart
3. Carry out programming using a structural language such as C in MS Windows
4. Demonstrate the use of UNIX/LINUX operating system environment
5. Use command line functions to handle files in windows and LINUX environment

Course Content

Software development life cycle. Top-Down design. Program, design using pseudo-code, flowchart. Flowchart ANSI symbols and usage. Extensive examples, and exercises using pseudo-code/flowchart to solve practical problems in engineering. Debugging and

documentation techniques. Programming using a structural language such as C: Symbols, keywords, identifiers, data types, operators, various statements, operator precedence, type conversion, conditional and control structures, function, recursive functions. Arrays: 1-D, and multidimensional arrays, passing elements or whole array to a function. Simple sorting and searching on arrays, pointers, strings, dynamic memory allocation. Structures and Unions: Structure declaration and definition, accessing structures, array of structures, pointers and structures, union declaration, enumerated variables. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, random access files. Advanced Topics: Command line parameters, pointers to functions, creation of header files, stacks, linked lists, bitwise manipulation. Software development in C in MS Windows, UNIX/LINUX environments, header file, preprocessor directives, make, make file. Static and dynamic linking libraries. Extensive examples, and exercises programming in C to solve practical problems in engineering. Exercises are to be done in the Computer Laboratory.

COE308: PROGRAMMING LANGUAGES (2 UNITS)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Carryout programming task using any of the selected compiler-oriented language like C
2. Carryout programming task using interpreter-oriented language like Java
3. Carryout debugging of program codes errors

Course Content

Complier-oriented languages e.g. C, C++, C#, and interpreter oriented languages, other languages like Java, IDE's Netbeans as well as other IDE's such as Dev Cpp, Visual Studio e.t.c, coding, debugging.

EEE304: ELECTROMAGNETIC FIELDS AND WAVES (3 UNITS)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Describe Gauss's Law, Ampere's law and Faradays Laws.
2. Describe time -varying magnetic and electric fields
3. Derive maxwells equations
4. Explain electromagnetic potentials, waves, boundary conditions and wave propagations
5. Explain principles of transmission lines and antennae

Course Content

Review of electromagnetic laws in integral form, Gauss's Law, Ampere's and Faraday's Laws; Electrostatic fields due to distribution of charge, magnetic fields in and around current carrying conductors, time-varying magnetic and electric fields; conduction and displacement current; Maxwell's equation (in rectangular co-ordinates and vector-calculus notation): Derivation of Maxwell's equations; electromagnetic potential and waves; Poynting vector; Boundary conditions; wave propagation in good conductors, skin effect; plane waves in unbounded dielectric media, Fundamentals of transmission lines, wave-guides and antennae.

EEE306: COMMUNICATION PRINCIPLES (2 UNITS)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Illustrate double sideband, single sideband and vestigial sideband modulation
2. Illustrate Amplitude modulated signal reception and loop
3. Explain transmission media and attenuations in open space, air, cable and fiber
4. describe correction of errors in PCM and DM

Course Content

Amplitude modulation; double sideband, single sideband and vestigial sideband modulation schemes; simple modulators, power and bandwidth performance. Angle modulation; frequency modulation, phase modulation, band width requirements, clipers and limiters. Amplitude modulated signal reception; discrimination, frequency tracking loop, phase locked loop and noise performance. Commercial radio systems. Transmission media; attenuation in open space, air, cable and fibre channels; construction of cables and fibres, sampling theorem, pulse amplitude modulation, pulse width modulation, multiplexing, quantization systems and pulse code modulation, delta modulation, courses and correction of errors in PCM and DM.

COE300: SWEP II (2 UNITS)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. demonstrate industrial workplace perceptions, ethics, health and safety consciousness, inter-personal skills and technical capabilities needed to give them a sound engineering foundation;
2. apply basic engineering techniques and processes applicable to their specializations;
3. design and construct machines, devices, structures or facilities relevant to their specific engineering programmes and applications; and
4. demonstrate good technical report documentation (log-book) and presentation of their practical experiences.

Course Content

In engineering education, industrial attachment is very crucial. The students are to proceed on ten weeks Students' Work Experience Programme (SWEP) during long vacation at the end of second semester examinations of 300 level.

GEN302 ENGINEERING COMMUNICATION (1 UNITS)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. demonstrate specification descriptions,
2. use graphs and tables in proposal presentations
3. carryout technical report writing in engineering designs case studies
4. carry out oral presentations of reports and proposal writing

Course Content

Professional use of English Language for letters, specification descriptions, presentation of charts, graphs, tables, writing of proposals in reports. Case studies of major engineering designs and construction/fabrication as well as industrial failures; professional presentation of reports and proposals.

EMA302 Engineering Mathematics IV (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. solve second order differential equations;
2. solve partial differential equations;
3. solve linear integral equations;
4. relate integral transforms to solution of differential and integral equations;
5. explain and apply interpolation formulas; and
6. apply Runge-Kutta and other similar methods in solving ODE and PDEs.

Course Content

Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturn-Louville boundary value problems. Solutions of equations in two and three dimensions by separationof variables. Eigen value problems. Use of operations in the solution of partial differential equations and Linear integral equations. Integral transforms and their inverse including Fourier, Laplace, Mellin and Handel Transforms. Convolution integrals and Hilbert Transforms. Calculus of finite differences. Interpolation formulae. Finite difference equations. RungeKutta and other methods in the solutions of ODE and PDEs. Numerical integration and differentiation.

400 Level First Semester

COE401: COMPUTER ENGINEERING LABORATORY III (2 UNITS)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. carryout selected experiments in Electronic Engineering
2. carryout selected experiments in Applied Microcomputer Programming

Course Content

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to Electronic Engineering, Applied microcomputer Programming and Workshop Technology Courses.

COE403 Microprocessor System and Interfacing (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. develop an ALP in 8085 microprocessors using the internal organization for the given specification;
2. describe the architecture and functional block of 8051 microcontroller;
3. develop an embedded C and ALP in 8051 microcontrollers using the internal functional blocks for the given specification;
4. explain various peripheral devices such as 8255, 8279, 8251, 8253,8259 and 8237; and
5. explain microcontroller application and basic architecture of PIC, ARM and ATMEGA processors.

Course Content

A basic microprocessor system: the CPU, memory, I/O, and buses subsystems, basic operation of a microprocessor system: fetch and execute cycle, the architecture of some typical 8-bit, 16-bit microprocessors (INTEL, MOTOROLA) and their features. Programming model in real mode: registers, memory, addressing modes. Organisation of the interrupt system, interrupt vectors, and external interrupts, implementation of single and multiple interrupts in real mode. Programming model in protected mode: registers, memory management and address translation, descriptor and page tables, system control instructions, multitasking and memory protection, addressing modes, and interrupt system. Memory interfacing and address decoding. I/O interfacing: memory mapped i/o, isolated i/o, bus timing, i/o instructions. Peripheral devices interfacing: 8255 PPI/6821 PIA, 8251 USART/6821 UART, DMA, Timer/Counter chips, etc. Instruction set. Assembly language Programming of INTEL and MOTOROLA microprocessors. Discussion of a typical system e.g. IBM PC, Apple Macintosh.

COE405: COMPUTER SOFTWARE ENGINEERING (3 UNITS)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. define software engineering problems, practices and problems
2. describe object-oriented programming
3. explain number representations, object structure and algorithms
4. apply knowledge of software engineering to carry out Object-oriented software design, implementation and testing.
5. Explain Cross-platform tools and GUI development.

Course Content

Introduction to software engineering fundamentals. Object-oriented programming. Number representations. Data structure and algorithms, abstraction, modules, and objects. Designing for efficiency. Object oriented software design, implementation and testing. Team software specification and management. Cross-platform tools and GUI development. Advanced software algorithms and architecture. Software engineering practice and methods.

COE407: CONTROL SYSTEM (3 Units)

Course Learning Outcomes

At the end of the course, students will be able to:

1. state examples of simple control systems;
2. solve Laplace and inverse Laplace transforms problems
3. carry out system modelling
4. carryout analysis of second order system as prototype
5. describe root locus plots
6. explain close loop frequency analysis
7. explain compensation technics in PD, PI M and PID controllers

Course Content

Introduction: definition, examples of control systems. Open-loop and closed-loop control systems. Review of Laplace and inverse Laplace transforms. System modelling: Signal flow graph, block diagram. Transfer function. Poles and zeros. Block diagram reduction using signal flow graph and block diagram reduction techniques. Mechanical, electrical and

electromechanical systems. First and second order models, higher order models. Definitions of transient response parameters. Analysis of second-order system as prototype. Routh-Hurwitz stability criterion. Classification of systems based on steady-state characteristics, steady-state error coefficient. Definition of Root locus, Properties of root locus, sketching of root locus plots. Effect of open-loop zeros and poles. Root locus design concepts. Frequency response analysis and design: Bode diagram, Polar plot, Nichols plot. Nyquist stability criterion: non-mathematical description of Nyquist criterion, interpretation of stability. Relative stability - Gain and phase margins. Closed-loop frequency response analysis - M and N contours, Nichols chart. Compensation techniques: lag, lead and lag-lead compensation, PD, PI and PID controllers. Cascade compensation based on root-locus method. Introduction to Feedback compensation. Computer-aided design and analysis of control system.

COE409: Prototyping Techniques (2 units)

Course Learning Outcomes

At the end of the course, students will be able to:

1. apply the knowledge of grounding, power decoupling and inductance in electronic circuit construction
2. demonstrate soldering techniques, breadboarding and use of vero-boarding.
3. Describe wire wrapping
4. Describe radio frequency design and implementation techniques.
5. Explain the use of PCB and CAD packages

Course Content

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

COE411: Assembly Language Programming (3 UNITS)

Course Learning Outcomes

At the end of the course, students will be able to:

1. describe language level of abstractions
2. identify and explain the different instruction set and addressing mode of Intel 8086
3. explain interrupt and service routine in 80x86 processor family
4. demonstrate intel 80x87 floating point programming
5. carryout MMX and SSE programming
6. describe Motorola 680210 assembly language programming

Course Content

Introduction: Language level of abstraction and effect on machine, characteristics of machine code, advantages , justifications of machine code programming, instruction set and dependency on underlying processor lntel 8086 microprocessor assembly language programming: Programming model as resources available to programmer addressing modes, instruction format, instruction set arithmetic, logical, string; branching, program control, machine control,

input/output , etc. assembler directives, hand assembling, additional 80x86 Pentium instructions. Modular interrupt and service routine. Interfacing of assembly language to C. intel 80x87 floating point programming. introduction to MMX and SSE programming. Motorola 680210 assembly language programming. Extensive practical engineering problems solving in assembly language using MASM for Intel, and cross-assembler for Motorola.

COE413: Computer Organization and Architecture (3 UNITS)

Course Learning Outcomes

At the end of the course, students will be able to:

1. describe the fundamental organization and architecture of a computer system;
2. explain single address machine
3. describe CISC and RISC computer Architecture
4. describe memory system and its implementations
5. describe Control Units and its various implementation types
6. explain UNIX/LINUX operating system: architecture, commands, programming
7. describe window based operating systems (MS windows,)

Course Content

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

COE415: Communication Principles (2 UNITS)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Illustrate double sideband, single sideband and vestigial sideband modulation
Illustrate Amplitude modulated signal reception and loop
2. Explain transmission media and attenuations in open space, air, cable and fiber describe correction of errors in PCM and DM

Course Content

Amplitude modulation; double sideband, single sideband and vestigial sideband modulation schemes; simple modulators, power and bandwidth performance. Angle modulation; frequency modulation, phase modulation, band width requirements, clipers and limiters. Amplitude modulated signal reception; discrimination, frequency tracking loop, phase locked loop and noise performance. Commercial radio systems. Transmission media; attenuation in open space, air, cable and fibre channels; construction of cables and fibres, sampling theorem, pulse amplitude modulation, pulse width modulation, multiplexing, quantization systems and pulse code modulation, delta modulation, courses and correction of errors in PCM and DM.

500 Level First Semester

GET 501: Engineering Project Management (3 Units C: LH 45)

Course Learning Outcomes

At the end of the course, students should be able to:

1. explain the basics of project management as it relates to the Engineering discipline;
2. demonstrate the knowledge of engineering, management and financial in given task and exercise
3. identify and describe project stakeholders, beneficiary and impacted persons.
4. carryout projects work breakdown schedule forecasting, role conflicts
5. apply optimization and linear programming for decision making
6. describe and apply the Breakthrough and control management theory

Course Content

Project management fundamentals – definitions, project environment, nature and characteristics, development practice, management by objectives, and the centrality of engineering to projects, infrastructures, national and global development. The scope of project management – organisational, financial, planning and control, personnel management, labour and public relations, wages and salary administration and resource management. Identification of project stakeholders; beneficiaries and impacted persons – functions, roles, responsibilities. Project community relations, communication and change management. Project planning, control and timeliness; decision making, forecasting, scheduling, work breakdown structure (WBS), deliverables and timelines, logical frameworks, (log frames), risk analysis, role of subject matter experts (SMEs), role conflicts; Gantt Chart, CPM and PERT. Optimisation, linear programming as an aid to decision making, transport and materials handling. Monitoring and Evaluation – key performance indices (KPIs); methods of economic and technical evaluation. Industrial psychology, ergonomics/human factors and environmental impact considerations in engineering project design and management. Project business case - financial, technical and sustainability considerations. Case studies, site visits and invited industry professional seminars. General principles of management and appraisal techniques. Breakthrough and control management theory; production and maintenance management.

Training and manpower development. The manager and policy formulation, objective setting, planning, organising and controlling, motivation and appraisal of results.

COE501 Computer Security Techniques I (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. describe computer hardware and software attacks
2. identify types of viruses and antivirus
3. explain the concepts and phases of developing secure computer system
4. explain cryptography systems and types
5. illustrate the trusted network implementation
6. explain database design and security measures

Course Content

Introduction: Overview of computer security, attacks and services, control of hardware and software. Usage. Intruders, Viruses and Worms: Intrusion techniques. Nontechnical attacks. Password protection and its vulnerability. Intrusion detection. Nature of viruses. Malicious programs. Types of viruses. Antivirus approaches. Worm propagation and countermeasures: access control, intrusion detection and firewalls. Disaster Recovery: Recovery requirements, policy, strategy, technical team. Execution of recovery plans. Documentation and backup system. Loss estimation. Developing Secure Computer System: External Security Measures, Issue, Security Models [Specification and Verification, Bell and LaPadulla Model, Clark-Wilson Model, Goguen-Meseguer, TCPEC], Discretionary Access Requirements, Mandatory Access Requirements, User Authentication, Access and Information Flow Control, Auditing and Intrusion Detection, Damage Control and Assessment, Microcomputer Security. Entropy, perfect secrecy, unicity distance, complexity theory, NP completeness, number theory. Cryptographic System, Public Key Systems, digital signatures. Network and Telecommunication Security: Fundamentals, Issue, Objective and Threats, Security Services, Distributed System Security, The Trusted Network Interpretation, TNI Security Services, AIS Interconnection Issues, Firewalls [Gateways, Application, Cost and Effectiveness .Database Security: Security Requirements to Databases, Designing the Security, Methods of Protection, Security of Multilevel Database.

COE503 Artificial Neural Network and Programming (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. differentiate and compare Artificial Neural Network ANN with human brain
2. categories ANN
3. explain single layer and multilayer perceptron; forward and backward propagation and gradient descent rules
4. use ANN to design a model
5. describe engineering applications of ANN

Course Content

Neural Network: Definition of artificial neural network. Similarities of neural network with human brain. Classification of ANN. Terminologies: input/output sets, weights, bias or

threshold, supervised learning, network training, Convergence process, single layer vs. multilayer perception, Forward and Backward propagation, and gradient descent rule. Back-propagation neural network, Variable term used in back propagation neural network: learning rate, momentum, hidden nodes, sigmoid activation function. Back propagation algorithm of ANN. Design of ANN model, training sets for ANN, test sets for ANN, network testing and performance. Engineering applications. ANN programming.

COE505: Reliability and Maintainability (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. apply reliability and maintainability techniques to prevent or reduce frequency of failures;
2. describe basic maintenance techniques and fault troubleshooting techniques;
3. explain concept of fault tolerance and software reliability
4. compare hardware and software reliability
5. describe and evaluate software qualities

Course Content

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

COE507 Cyberpreneurship and CyberLaw (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. explain trends in entrepreneurship management and characteristics
2. describe planned development and forecasting development of a business
3. explain how to finance a business
4. describe nature and function of Nigerian media law

Course Content

Introduction: Definition of creativity, innovation, examples of creativity leading to innovation, commercialization of creative and innovative ideas. Trends in technology development. Entrepreneurship management and ownership. Characteristics of entrepreneur, starting a new business, business planning, strategic planning and management, site selection and layout.

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

COE509: Data Communication and Network (3 units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. outline the types of data and simple communications.
2. Describe transmission modes
3. Describe the seven-layer standard network protocols
4. Explain error control, data recovery and data compression on a network
5. Explain types of computer networks
6. Explain internet protocol IPv4, IPv6 and Internet programming

Course Content

Introduction to Data communications: the Development of Data Communications; types and sources of data, simple communications network, transmission definitions, one way transmission, half duplex transmission, transmission codes, transmission modes, parallel transmission, serial transmission, bit synchronization, character synchronization, character synchronization, synchronous transmission, asynchronous transmission, efficiency of transmission, error detection methods and data compression. Protocols: Introduction to network protocol. Seven Layer ISOOSI standard protocols and network architecture. Transport protocols, session services protocols, and other protocols. Institute of Electrical and Electronics Engineering 802 standards. Error control and Data Compression: Forward Error Control; error detection methods; parity checking; linear block codes, cyclic redundancy checking; feedback error control, data compression, Huffman coding and dynamic Huffman coding. Local Area Networks: medium access control techniques – Ethernet, token bus and token ring; LAN standards; fibre distributed data interface, metropolitan area network. Peer-to-peer, Client Server. ClientServer Requirements: GUI design standards, interface independence, platform independence, transaction processing, connectivity, reliability, backup and recovery mechanisms. Information Network Software; Features and benefits of major recovery mechanisms. Information Network Software: features and benefits of major Network

Operating Systems. Network OS: (e.g. Novell NetWare, UNIX/LINUX, OS/2 & Windows NT). TCP/IP and Network OS. INTERNET: Definition, architecture, services, Internet addressing. Internet protocol, IPv4, IPv6. Internet programming, Intranet. System administration, and security issues.

COE501: Microprogramming (3 UNITS)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Describe microcontroller memory organization
2. Explain microcontroller instruction types
3. Describe serial port operations and interrupts
4. Demonstrate LCD programing

Course Content

Programs: Big and Small. Microprocessors vs microcontrollers. I/O port structure. Timing and the Machine Cycle. Microcontroller Memory Organization. Code memory, External RAM, On-chip memory. Internal RAM structure. Register Banks. Bit Memory. General purpose RAM. Special Function Registers. Addressing modes- register, direct, indirect, immediate, relative, absolute, long and indexed addressing modes. Microcontroller instruction types. Timer operations. Timer applications- event counting, interval timing and Baud rate generation. Timer modes of operation and timer overflow flags. Example programs with Intel 8051. Serial port operations. Serial port operating modes. Examples with Intel 8051.Interrupts. Interrupt vectors. The concept of polling and polling sequence in microcontrollers. Initializing interrupts. Interrupt sources. Interrupt priorities. Programs using interrupts. LCD programming.

COE513 Design and Installation of Electrical, and ICT services (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Describe health and safety at work act in Nigeria
2. Explain electricity supply regulations
3. Describe lightening and illuminations in terms of intensity and flux
4. Describe how to install electronics for domestic, commercial and industrial use
5. Explain alarm emergency systems, earthling and protection
6. Explain telephone design and installations

Course Content

Electrical Installation: Induction to Health and safety at work act in Nigeria. Electrical safety. First aid. Electricity supply regulations. Lighting and Illumination: Luminous intensity and flux. Maintenance factor. Coefficient of utilization. Types of light sources. Calculation of lighting requirements. Glare. Stroboscopic effect. Installation Materials, cables, junction box, terminations, joints. Conduits and conduiting. Truck and trucking. Electrical Installation design in domestic, commercial and industry. Alarm and emergency systems. Earthling and Protection. Purposes of earthing. Faraday cage. Rod electrodes. Earth electrode resistance. Earthing system. Earth fault loop impedance. ICT services: NCC and FCC codes of practice and

standards. Telecommunication design and installation: Satellite, VSAT, etc. Telephone design and installation. Computer networking design and installation. Wireless LAN design and installation. Preparation of Bill of Engineering Measurement Evaluation. Contract bidding. Consultancy.

COE515 Computer Security Techniques II (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. Describe cryptographic systems
2. Explain data encryption methods
3. Describe video scrambling techniques
4. Outline security and legal issues in computer security
5. Explain ethical issues in computer security

Course Content

History of cryptographic System, Public Key Systems, Digital Signature. Information Theory: Entropy, Perfect Secrecy, Unicity Distance, Complexity Theory, NP Completeness, Number Theory. Data Encryption Method Ciphers, Knaspsack Ciphers, Breakable NP-Complete Knapsack, Encryption Standards DES, RSA, Elliptic Curves. Cryptographic Techniques: Block and Stream Ciphers, Autokey, Endpoints of Encryption, One-Way Ciphers, Password and Authentication, Secret Keys and Public Keys, Threshold Scheme. Video Scrambling techniques. Digital video encryption techniques: principle, IRDETO, Viaaccess, Videoguard, etc. Security and Legality Issues: Copyrights, Patents, Trade Secret, Ownership of Products, Computer Crimes, Ethnical Issue in Computer Security.

Second Semester

GEN 502: Engineering Law (2 Units C: LH 30)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. describe law of contractors for engineers and forms of contract
2. explain the criteria for selecting engineering contractors
3. explain duties of employer towards employee
4. describe general principle of criminal laws
5. describe labor law and industrial law

Course Content

Common Law: its history, definition, nature and division. Legislation, codification interpretation. Equity: definition and its main spheres. Law of contracts for Engineers: Forms of contract and criteria for selecting contractors; offer, acceptance, communication termination of contract. Terms of Contracts; suppliers' duties – Damages and other Remedies. Termination/cancellation of contract Liquidation and Penalties; exemption clauses, safety and risk. Health and Safety. Duties of employers towards their employees. Duties imposed on employees. Fire precautions act. Design for safety. General principles of criminal law. Law of torts: definition, classification and liabilities. Patents: requirements, application, and infringement. Registered designs: application, requirements, types and infringement. Company law. Labour law and Industrial Law. Business registration.

COE 502: Digital Image Processing (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. define digital image processing and identify image formats
2. describe edge detecting techniques, image morphology, and segmentation methods
3. apply fourier transform and wavelet transform in image processing
4. describe application of ANN to digital image processing
5. explain colour representation standard
6. explain the image compression techniques

Course Content

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

COE 504 Digital System Design with VHDL (3 Units)

Course Learning Outcomes

On completion of this course, the students will be able to:

1. explain VHDL as a programming language;
2. design the combinational and sequential logic circuits using VHDL;
3. design programmable logic devices (PLDs) and networks of arithmetic operations;
4. use VHDL software package and utilise software package to solve problems on a wide range of digital logic circuits.

Course Content

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

constraints, technology library, delay calculation, synthesis tool, synthesis directives. Computer-aided design of logic circuits.

COE506: Computer Graphics and Animations (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. describe 3D animation and its application
2. describe wireframe, surface and solid modeling
3. explain the polygonal modelling techniques
4. explain Animation Techniques such as Walk Cycle and Facial Expression using Blend Shape
5. describe the concept of rendering in 3D modeling

Course Content

Overview of 3D animation and its application and types. Coordinate system, vertex, faces and object. Concept of wireframe, surface and solid modelling. Construction planes and differences between object space and world space. Principles of making characters alive. Polygonal Modelling techniques: the Box, using Edit Mesh, Smoothing Techniques, Subdivision Surfaces. Nurbs Modelling techniques: Utilizing NURBS toolbox, surface points and CVs. Importing and attaching NURBS surfaces, rebuilding surfaces, curve and surface approximation. Graphic animation process: Camera and Animation Camera, Set and Background (Image Plane), Light Linking. Animation Techniques: Walk Cycle and Facial Expression using Blend Shape. Dynamics animation: Rigid Bodies, Soft Bodies, constraint, Particles. Tips and tricks on rendering. Concept of Rendering in 3D modelling. Render options and file output.

COE508: Embedded System Design (3 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. describe the features of 8051/8031 processor family
2. explain the instruction set and assembly language programming of 8051 microcontroller-based system
3. describe the features of the M6811 family, blockdiagram and definitions of the pin of the M6811
4. Explain On-chip peripheral devices and I/O interfacing.
5. Describe PIC microcontroller
6. Describe memory interfacing: external memory interfacing, EEPROM and Flash memory interfacing

Course Content

Introduction to embedded system, components, characteristics, applications. Intel8051/8031 Micro-controller: Features of the 8051/8031 family, block diagram anddefinitions of the pin of the 8051, I/O port structure, memory organisation: generalpurpose RAM, bit addressable RAM, register bank, special function registers, external memory, memory space mapping and decoding, bus control signals timing,a typical 8051 micro-controller based system. Instruction

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

COE512: Fuzzy Logic and Programming (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. illustrate knowledge-based problems, objectives and subjective knowledge
2. describe the law of contradiction and excluded middle
3. explain Fuzzy relations and compositions on the same and different product spaces
4. explain Max-Product composition, fuzzy relational matrix, sup-star composition
5. carry out fuzzy modeling

Course Content

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

COE514: Robotic and Automation (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. explain the historical evolution of robots
2. describe robotic work space analysis and trajectory planning
3. explain task-oriented control and human interfacing
4. describe automated assembly systems
5. explain linear feedback control systems

Course Content

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

COE516: Cryptography Principles and Applications (2 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. describe public key system and digital signature
2. explain Data Encryption Methods such asTransposition Ciphers, Substitution Ciphers, Product Ciphers
3. describe Digital video encryption techniques
4. explain security and legality issues; Copyrights, Patents, Trade Secret, Ownership of Products, Computer Crimes

Course Content

History of cryptographic System, Public Key Systems, Digital Signatures. Information Theory: Entropy, Perfect Secrecy, Unicity Distance, Complexity Theory, NP Completeness, Number Theory. Data Encryption Methods: Transposition Ciphers, Substitution Ciphers, Product Ciphers, Exponentiation Ciphers, Knapsack Ciphers, Breakable NP-Complete Knapsack, Encryption Standards DES, RSA, Elliptic Curves. Cryptographic Techniques: Block and Stream Ciphers, Autokey, Endpoints of Encryption, One-way Ciphers, Password and Authentication, Secret Keys and Public Keys, Threshold Scheme. Video scrambling techniques. Digital video encryption techniques: principle, IRDETO, Viaaccess, Videoguard, etc. Security and Legality Issues: Copyrights, Patents, Trade Secret, Ownership of Products, Computer Crimes, Ethical Issue in ComputerSecurity.

COE 591/592: Final Year Project (6 Units)

Course Learning Outcomes

At the end of the course, the students should be able to:

1. apply computer engineering knowledge to develop a technology and/or system to solve a known and significant computer engineering problem
2. design, and if possible/practicable, build/produce/manufacture some relevant new hardware/device(s) representing the solution using the skills acquired in the computer engineering programme.
3. Carry out computer simulations and modelling of solution to problems in a research study.
4. Describe in written technical or research report (project) the observations, discovery and evaluations about the computer engineering experiments and investigations carried out.
5. Discuss and present orally the results of the computer engineering research study carried out.

4.0 Examination

Each course shall normally be conducted and examined at the end of each semester in which it is offered. The examination shall be conducted as prescribed by the senate. A system of continuous assessment shall be used for every course and shall contribute 30% to the total score for each course. Continuous Assessment for students shall be by means of term papers, regular tests (formal and informal), assessment in workshop/laboratory.

4.1 Degree Classification

The following regulations shall govern the conditions for the award of a degree:

1. Candidate admitted through the UTME mode shall have registered for the minimum 209 credit units of courses in his/her discipline during the 5-year degree programme while direct entry students shall register a minimum of 174 credit unit during the 5-years degree programme.
2. Candidates must have registered and passed all compulsory and required courses as well as the number of elective courses specified for the programme.

The determination of the class of degree shall be based on the Cumulative Grade Point Average earned at the end of the programme. The GPA is computed by dividing the total number of credit points (TCP) by the total number of units (TNU) for all the courses taken in the semester. The CGPA shall be used in the determination of the class of degree as summarized in Table 1. It is important to note that CGPA shall be calculated and expressed correctly to two decimal places. The maximum length of time allowed to obtain a degree in the Faculty shall be fifteen semesters for the PUTME students and thirteen semesters for students admitted as direct entry students at 200 level. For extension beyond the maximum period, a special permission of Senate shall be required on the recommendation of the Departmental and Faculty Boards.

Table 1: Degree classification

Cumulative Grade Point Average (CGPA)	Class of Degree
4.50 – 5.00	First Class (Hons)
3.50 – 4.49	2nd Class Upper (Hons)
2.40 – 3.49	2nd Class Lower (Hons)

1.50 – 2.39	3rd Class (Hons)

4.2 Student Performance Standards

Stdents will be expected to register for between 15-24 credit Units per semester. The minimum CGPA to proceed from 100 - 200 Level shall be 2.00. From 200 - 500 Level, the minimum CGPA to proceed to the next Level shall be 1.50.

4.2.1 Probation

A student whose Cumulative Grade Point Average is below 1.0 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 his failed courses at that level and lower levels only.

4.2.2 Withdrawal

A candidate whose Cumulative Grade Point Average is below 2.0 at the end of a particular year of probation should be required to withdraw from the Department. However, in order to minimize waste of human resources, consideration should be given to transfer to other programmes within the University.

4.2.3 Students On Transfer

Students with a CGPA of 3.50 and above from Science-based Faculties who desire to transfer into Computer Engineering programmes shall be considered based on merit and relevance of Courses already taken and passed.

Students who transfer from other universities with a CGPA of not less than 3.50 shall be credited with only those courses, deemed relevant to the programme. Such students shall however be required to pass the minimum number of units specified for graduation for the number of sessions he/she has spent in the Department; provided that no student shall spend less than two sessions (4 semesters) in order to earn a degree. Students who transfer for any approved reason shall be credited with those units passed that are within the curriculum. Appropriate decisions on transfer cases shall be subjected to the approval of Senate on the recommendation of the Department and Faculty.

5.0 Course Credit System

Computer Engineering programmes shall be run on a modularised system, commonly referred to as Course Unit System. All courses would therefore be sub-divided into more or less self-sufficient and logically consistent packages that are taught within a semester and examined at the end of that particular semester. Credit weights would be attached to each course. One credit is equivalent to one hour per week per semester of 15 weeks of lectures or 2 hours of tutorials or 3 hours per week of laboratory/studio work per semester of 15 weeks.

6.0 Grading of Courses

Grading of courses shall be done by a combination of percentage marks and letter grades translated into a graduated system of Grade Point as shown in Table 2

Table 2: Grade point system

Mark	Letter Grade	Grade Point
70 – 100	A	5
60 – 69	B	4
50 – 59	C	3
45 – 49	D	2
40 – 44	E	1
< 40	F	0

6.0.1 Grade Point Average and Cumulative Grade Point Average

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 Units x Grade Point (TUGP) by the total number of units (TNU) for all the courses taken in the semester as illustrated in Table 3.

The Cumulative Grade Point Average (CGPA) over a period of semesters is calculated in the same manner as the GPA by using the grade points of all the courses taken during the period.

Table 3: Calculation of GPA or CGPA

Course	Units	Grade Point	Units x Grade Point (TUGP)
C_1	U_1	GP_1	U_1 x GP_1
C_2	U_2	GP_2	U_2 x GP_2
-	-	-	
-	-	-	
Ci	Ui	GP_i	Ui x GPi
-	-	-	
-	-	-	
C_N	U_N	GP_N	U_N x GP_N
TOTAL	TNU		TUGP

Note: GPA =TUGP/TNU

7.0 Evaluation

7.0.1 Techniques of Student Assessment

A). Practicals

By the nature of the disciplines in Engineering, laboratory practicals are very important in the training of the students. To reflect this importance of practical work, a minimum of 9 hours per week (3 credits) should be spent on students' laboratory practicals. Furthermore, it is very important to determine performance of the student in the practical component of the programme. To achieve this, all the laboratory practicals have been lumped together to form a course which the student must pass. It is expected that the weighting given in the various courses is reflected in number and nature in the design of the experiments. These practicals must follow the trend in the current development of the programme.

B). Tutorials

There should be one hour of tutorial for every four hours of lecture. Thus, a course of one credit unit should comprise 12 hours of lecture and three hours of tutorials.

C). Continuous Assessments

Continuous assessment shall be done through essays, tests, and practical exercises. Scores from continuous assessment shall normally constitute 30% of the final marks for courses which are primarily theoretical. For courses which are partly practical and partly theoretical, scores from continuous assessment shall constitute 50% of the final marks. For courses that are entirely practical, continuous assessment shall be based on a student's practical work or reports and shall constitute 100 % the final marks.

D). Examinations

In addition to continuous assessment, final examinations should normally be given for every course at the end of each semester. The final grade would be based on the following breakdown.

Final Examination:	60% - 70%
Continuous assessment (Quizzes, Tutorials, Homework, Tests):	30% - 40%

Each course shall normally be completed and examined at the end of the semester in which it is offered.

A written examination shall normally last a minimum of one hour for one-unit course.

8.0 External Examiners' System

The external examiner system would be used only in the final year of the undergraduate programme to assess final year courses and projects, and to certify the overall performance of the graduating students, as well as the quality of facilities and teaching.

9.0 SIWES Rating and Assessment

In Engineering education, industrial attachment is very crucial. The minimum duration of this attachment should be 34 weeks (one semester and 2 long vacations) and would be broken into the following modules: Students Work Experience (SWEP) Programme (10 weeks – long vacation); Students Industrial Work Experience Scheme (SIWES) (24 weeks, one semester plus long vacation).

To make the training effective, it is important that the students learn how to operate some of the ordinary machines and tools they will encounter in the industry before they go for the attachment. Therefore, they would start with SWEP, which is conducted in the Faculty Workshops/Department laboratories, under strict industrial conditions. On successful completion of SWEP, the Students Industrial Work Experience Schemes would be done in industries under strict industrial conditions and supervision.

Normally, industrial attachment would be graded, and no student should graduate without passing all the modules of the attachment and this should be used in degree classification.

10.0 Students' Evaluation of Courses

There is an established avenue put in place offering opportunity to students to evaluate courses delivered to them at the end of each semester. This is an integral component of the course credit system, serving as feedback mechanism for achieving the following:

i). Improvement in the effectiveness of course delivery.

ii). Continual update of lecture materials to incorporate emerging new concepts.

iii). Effective usage of teaching aids and tools to maximize impact of knowledge on students.

iv). Improvement in students' performance through effective delivery of tutorials, timely in presentation of continuous assessment and high-quality examination.

In order to achieve effective learning, all students should normally be permitted to evaluate those courses registered at the end of each semester, preferably before the final semester examinations. It is very important that students' evaluation of courses be administered fairly and transparently through the use of well-designed questionnaires, maintain confidentiality demanded by such exercise and apply their scientifically processed outcome to improving effective course delivery in all ramifications.

11.0 Categories of Courses Taken at Undergraduate Level

11.0.1 Core/Compulsory Course

A course which every student must compulsorily take and pass in any programme at a particular level of study.

11.0.2 Required Course

A course that you take at a level of study and must be passed before graduation.

11.0.3 Elective Course

A course that students take within or outside the faculty. Students must pass all elective courses before they can graduate

11.0.4 Optional Course

A course which students can take based on interest and may count towards the minimum credit unit required for graduation.

11.0.5 Pre-Requisite Course

A course which student must take and pass before taking a particular course at a higher level. Minimum and Maximum Credit Load Per Semester. The Minimum credit load per semester is 15, while the maximum is 24.

12.0 Course Credit Unit System

This should be understood to mean a 'quantitative system of organization of the curriculum in which subject areas are broken down into unit courses which are examinable and for which students earn credit(s) if passed'. The courses are arranged in progressive order of difficulty or in levels of academic progress, e.g. Level or year 1 courses are 100, 101 etc. and Level II or Year II courses are 200, 202 etc. The second aspect of the system is that courses are assigned weights through Credit Units.

12.1 Grade Point Average (GPA)

Performance in any semester is reported in Grade Point Average. This is the average of weighted grade points earned in the courses taken during the semester. The Grade Point Average is obtained by multiplying the Grade Point in each course by the number of Credit Units assigned to that course, and then summing these up and dividing by the total number of Credit Units taken for the semester.

12.2 Cumulative Grade Point Average (CGPA)

This is the up-to-date mean of the Grade Points earned by the student in a programme of study. It is an indication of the student's overall performance at any point in the training programme. To compute the Cumulative Grade Point Average, the total of Grade Points multiplied by the respective Credit Units for all the semesters are added and then divided by the total number of Credit Units for all courses registered by the student.


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