EDO STATE UNIVERSITY UZAIRUE
EDO STATE, NIGERIA
(FORMERLY EDO UNIVERSITY IYAMHO)

FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER ENGINERRING

STUDENT HANDBOOK

2023 -2028 EDITION

Administrative Building

Faculty of Engineering

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Ag. Bursar, Mr. Osifo Osagie Uwagboe

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Mission Statement of the University

Through its teaching, research, and innovation activities, the Edo State university Uzairue is poised to be a major contributor in the advancement of knowledge, wisdom and understanding for the benefit of the University in encouraging and promoting scholarship and will relate its activities to social, cultural and economic needs of the people of Edo State in particular, Nigeria and the world in general.

Vision Statement of the University

The vision of Edo State University Uzairue is to become a center of excellence in quality teachin, research, innovations and community development.

Motto: The motto of the Edo State University is "Quality Education for Development".

Staff of the Department of Computer Engineering

S/N	Name	Qualification	Area of Specialization	Designation
1	Dr. Bello, O.L., PhD	Ph.D (UTP), M.Sc.(UTP) B.Eng.(UNIBEN)	Neural Networks. Machine Learning and Deep Learning. RF and Microwave Engineering. Millimeter Wave and 5G Filter Design.	Lecturer 1 /Lecturer-in-Charge
2	Engr. Dr. Chinedu, P. U.	Ph.D (FUTO), M.Sc (UK), PGD (FUTO), HND (AUCHI) Regd Engr. (COREN)	Information Technology, Cloud Computing, Virtualization, Cybernetic and Information Security	Associate Professor
3	Engr. Dr. Ikharo, A. B.	Ph.D (ATBU), M.Eng (ATBU), B.Eng (ATBU), PGD Computer Sc (ATBU), PGDE (UDU) Regd Engr. (COREN)	Mobile Cellular Communication, Radio Refractivity & Troposheric Propagation, Data Analytics, Computer Networks and Security, IoT and Block Chain, Bioinformatics & Operations Research	Senior Lecturer
4	Engr. Dr. Aliu, D.	Ph.D(ABU), M.Sc. (ABU), B.Eng (FUTMINA) MNSE, Regd Engr. (COREN)	Watermarking (Image processing and Artificial Intelligence) and Quantum Cryptography	Senior Lecturer
5	Engr. Dr. Obasi, C. C.	Ph.D (UNN), M.Eng.(UNIZIK) B.Eng.(ESUT)	IoT, Embedded System, Robotics, Machine Learning	Lecturer 1
6	Engr Oisamoje V	M.Eng (UNIBEN), B.Eng (AAU)	Mobile Communications	Lecture II

B. Eng Computer Engineering

Overview

The Computer Engineering Programme is designed to prepare the computer engineering graduate to acquire the requisite skills in the learning, literacy and life domains. The learning domain highlights critical thinking, creativity, collaboration and communication while literacy focuses on information, media, and technology complemented by the life skills that demonstrate flexibility, leadership, initiative, productivity and social balance. The Computer Engineering Programme is conceived to produce engineers who can work with all aspects of computers (software and hardware) and other engineering professionals in a world in which high-level language software, complex programme and smart hardware are complementing and progressively replacing human effort in solving societal problems.

The Programme, therefore, prepares the students towards the design, analysis, and application of computers and computer-based systems in the development and production of peripheral and remote devices/computer systems to manage all economic sectors including services, energy, infrastructure, health, environment, entertainment, sports and security. Furthermore, the Programme is designed to prepare the learner for the increasing need for Human-Computer Interface (HCI) requiring higher levels of automation and control of all aspects of the cyber physical environment engendered by the expanding age of Internet of Things and People (IoTP).

The Computer Engineering Programme includes several courses in Computation, Computer Science (such as data structures and operating systems) and Electrical and Electronics Engineering (such as circuits and electronics). Graduates are expected to have a sound knowledge of the fundamentals in electrical or computer engineering that allows them to analyse and solve technical problems, apply hardware and software tools to problem solving, and create, develop and manage complex computer-based technologies, products and services. The primary areas of specialisation are:

1. Artificial Intelligence (developing computers that simulate human learning and reasoning abilities)
2. Computer Architecture (designing new computer instruction sets, and combining electronic or optical components to yield powerful computing systems)
3. Computer Design and Engineering (designing new computer circuits, microchips, and other electronic computer components and devices)
4. Computer Theory (investigating the fundamental theories of how computers solve problems, and applying the results to other areas of computer engineering)
5. Information Technology (developing and managing information systems that support high-volume/speed data acquisition, processing, storage and retrieval for businesses and other organisations)
6. Operating Systems and Networks (developing the basic software used by computers to supervise themselves or to communicate with other computers, devices, humans and the environment)
7. Robotics (designing computer-controlled machines or robots for performing high-precision and high-speed repetitive industrial tasks and processes)
8. Software Applications (developing software to solve problems in multiple areas such as education, finance, space, medicine, infrastructure, etc.) and
9. Software Engineering (developing computer algorithms for solving complex problems of computation and analysis using different data forms).

This B.Eng./B.Sc./B.Tech. Computer Engineering Core Curriculum and Minimum Academic Standards (CCMAS) are approved by the National Universities Commission (NUC) for use in all Nigerian universities for the education and training of Computer Engineers. It is the product of the collaborative work of subject matter experts (SMEs) in the Nigerian universities and industry professionals/practitioners and regulators. It constitutes the latest revision to the National Universities Commission's (NUC's) B.Eng./B.Sc./B.Tech. Computer Engineering Benchmark Minimum Academic Standards (BMAS) which debuted in 2007. This new CCMAS contains many similarities with, as well as improvements over, equivalent programmes globally while also making allowance for individual Universities to create specialisation niches derived from environmental (local, international, industrial) need-based product differentiation.

Philosophy

The general philosophy of the Computer Engineering CCMAS is to produce graduates with hard, soft and research skills that are useful in analysing, evaluating, designing, developing, manufacturing, procuring, marketing, managing and maintaining the computing, electronics, communication, information processing, and operating systems embedded in computer hardware and devices used by individuals, and private and public organisations.

Objectives

The broad objective is to produce graduates that have the requisite knowledge, skills and emotional disposition needed for a 21st century world that increasingly demands greater, more advanced, efficient, sustainable and client-centric technological solutions. Specific objectives include:

1. applying the knowledge gained from courses in mathematics, science (social and basic), computing, and algorithmic reasoning to resolve Computer Engineering challenges individually or within multidisciplinary groups/teams;
2. understanding and applying discrete mathematics and computation;
3. defining complex engineering problems, collecting, analysing data and problems as well as developing models and implementing solutions for engineering problems;
2. analysing, designing and optimally managing the hardware/software computer system requirements of organisations with constrained resources;
3. using modern computer engineering models, tools, and information technologies to develop computer hardware;
4. undertaking research, and laboratory and real-life and real-time experiments by using computers and computer-based devices/systems and having the ability to acquire, analyse, and interpret data and to solve engineering and other problems locally and globally;
5. working on interdisciplinary and multidisciplinary concepts with teams as well as individually in developing new computer engineering knowledge, products, and services needed for the seamless functioning and wellbeing of society;
6. appreciating and using life-long learning to improve self-employability as well as adapting to future professional and ethical responsibilities in an efficient, effective, fair, responsible and competitive manner;
7. practising in different roles as engineering managers, project managers, innovators, entrepreneurs, quality controllers, researchers/knowledge creators and managers in the computer engineering field; and
8. having an understanding of contemporary as well as legal and ethical issues impinging on computer engineering solutions deployed in society.

Unique Features of the Programme

There are a number of unique features that characterise this computer engineering CCMAS curriculum:

1. a conscious duality focus in terms of preparing the students to ethically advance scientific knowledge as academics/researchers/trainers, and as culturally, environmentally sensitive and competent industry professionals;
2. more student directed learning, and reduction in classroom contact time by reducing each semester credits to between 15 – 18;
3. increased application of the computer system and computer software in the programme in both teaching and learning;
4. early familiarization of the students with the computer engineering discipline in terms of knowledge, skills and role expectations/responsibilities via an introductory course as early as the second semester of the first year of the programme;
5. 'signature Courses' (SCs): an allowance of 30% of total credits required for graduation to be used by individual Universities to introduce 'signature' courses/programmes pursuant to developing in-demand/industry-relevant knowledge/skills /technologies that target specific industry groups so as to drive innovation and entrepreneurship, research (R&D) funding by associated industry groups, minimise educational tourism/brain drain; deliberately create knowledge/skill/product/service differentiation among computer engineering programmes in Nigerian Universities thereby leading to deeper specialisation, wider and global recognition, emergence of Centers of Excellence and Influence (CEIs) and increased economic growth and development;
6. recommendation, and in some instances, outright prescription of cooperative or co-teaching for a course by resource persons from other disciplines/faculties in order to maximise learning;
7. recommendation of the use of more real-life/real-time simulation/demonstration approaches and qualified/certified industry-based facilitators for the delivery of courses in order to deepen learning, approximate industry contexts as well as engender more town and gown (R&D) and funding collaboration; and
8. capacity for increased skills in innovation, creativity and productive entrepreneurship orientation through the introduction of a capstone engineering business development and management course in the final year of the programme.

Employability Skills

Based on this CCMAS, the Computer Engineering programme graduate will acquire requisite skills that will enable them to:

1. apply knowledge of mathematics, science and computer engineering to the solution of local and global engineering problems;
2. identify, formulate, research literature and analyse computer engineering problems and proffer informed, efficient and effective theoretical and practical solutions;
3. design, develop and deploy computer-based systems, devices or processes to meet specified computer engineering needs;
4. apply critical reasoning and logic in resolving engineering problems using research-based knowledge and research methods including the set-up of experiments, analysis and interpretation of data, and distilling of information to create new knowledge, products and services;
5. create, select and apply appropriate techniques, resources and modern engineering and ICT tools, including prediction, modelling and optimisation to developmental and complex engineering activities, with a clear understanding of the theoretical and practical limitations;
6. apply ethical principles at all times in practice as a subject matter expert and professional;

7. function effectively as an individual and as a reliable collaborator, partner, team member or leader;
8. communicate effectively on developmental or complex engineering activities;
9. demonstrate knowledge of the principles of organisation, engineering, management, corporate social responsibility and finance; and
10. exhibit evidence of independent and lifelong learning and community service.

21st Century Skills

The B. Eng./B.Tech. /B.Sc. Computer Engineering CCMAS has the capability of inculcating into the graduate engineer skills essential for the 4th industrial revolution such as:

1. critical thinking and problem solving
2. creativity and innovation
3. collaboration and team work
4. communication and information literacy
5. media literacy
6. computation and data management
7. technology literacy
8. flexibility
9. leadership and ethical responsibility
10. initiative

Admission and Graduation Requirements

Admission Requirements

Candidates are admitted into the degree programme in any of the following two ways:

1. Indirect Entry (5 Year Degree Programme)
2. Direct Entry (4 Year Degree Programme)

Indirect Entry

For Five year Indirect admission, in addition to acceptable passes in Unified Tertiary Matriculation Examination (UTME), the minimum academic requirement is credit level passes in Senior Secondary Certificate (SSC) in at least five subjects which must include English Language, Mathematics, Physics, Chemistry and other acceptable science subject at not more than two sittings.

Direct Entry

For Four year Direct Entry, in addition to five (5) Senior Secondary Certificate (SSC) credit passes which must include English Language, two of which must be principal subjects at Advance GCE Level or NCE and its equivalent. Holder of upper credit level at HND are eligible for consideration for admission into 300 levels respectively.

Graduation Requirements

The degree title to be awarded under this CCMAS shall be a Bachelor of Engineering (B.Eng) or Bachelor of Science (B.Sc.) or Bachelor of Technology (B.Tech.) in Computer Engineering, as may be approved by the awarding University's Senate.

Candidates must have registered and passed all the compulsory courses specified for the programme.

Candidates admitted through the UTME mode shall have registered for, at least, 150 units of courses during the 5-year (cumulative residency) degree programme.

The Computer Engineering programme shall be run according to the modularised course unit philosophy of this NUC CCMAS. All courses should, therefore, be sub-divided into more or less stand-alone but logically consistent and progressive learning packages that are taught

within a semester and examined at the end of the particular semester with the appropriate composite practical/field/project work, as may be the case. Credits are weights attached to a course. One credit is equivalent to one hour per week per semester of 15 weeks of lectures/tutorials or three hours of laboratory/studio/workshop work per week per semester of 15 weeks.
The determination of the class of degree shall be based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme. The CGPA shall be used in the determination of the class of degree

Global Course Structure

Level	General Studies	Basic Science	Discipline GET	Programme (CPE)	SIWES*	Total Units
100	4	16	3	2	-	25
200	4	-	28	-	3	35
300	2	-	14	22	4	38
400	-	-	-	11	8	21
500	-	-	11	20	-	31
Total	**10**	**16**	**56**	**68**	**15***	**150**

*All credited in the 2nd Semester of 400 level

Summary of Courses

100 Level

Course Code	Course Title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
MTH 101	Elementary Mathematics I: Algebra and Trigonometry	2	C	30	-
MTH 102	Elementary Mathematics II: Calculus	2	C	30	-
PHY 101	General Physics I: Mechanics	2	C	30	-
PHY 102	General Physics II: Behaviour of Matter	2	C	30	-
PHY 107	General Practical Physics I	1	C	-	45
PHY 108	General Practical Physics II	1	C	-	45
GET 101	Engineer in Society	1	C	15	-
GET 102	Engineering Graphics and Solid Modelling I	2	C	15	45
CPE 112	Introduction to Computer Engineering	2	C	30	-
	Sub Total	**19**			
EDSU-CPE 111	General Chemistry I	2	C	30	-
EDSU-CPE 121	General Chemistry II	2	C	30	-
EDSU-CPE 112	General Chemistry Practical I	0	C	-	45
EDSU-CPE 122	General Chemistry Practical II	0	C	-	45
EDSU-CPE 113	Elementary Mathematics III	2	C	30	-
	Sub Total	**6**			
	Total	**25**			

200 Level

Course Code	Course Title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
GET 201	Applied Electricity I	3	C	45	-
GET 202	Engineering Materials	3	C	45	-
GET 203	Engineering Graphics and Solid Modeling II	2	C	15	45
GET 204	Students Workshop Practice	2	C	15	45
GET 207	Applied Mechanics	3	C	45	-
GET 209	Engineering Mathematics I	3	C	45	-
ENT 211	Entrepreneurship and Innovation	2	C	30	-
GET 211	Computing and Software Engineering	3	C	30	45
GET 210	Engineering Mathematics II	3	C	45	-
GET 299	SIWES I: Students Work Experience Scheme	3	C	9 Weeks	
Sub Total		**26**			
EDSU-CPE 222	Applied Electricity II	2	C	15	45
EDSU-CPE 225	Fundamental of Fluid Mechanics	3	E	45	-
EDSU-CPE 226	Fundamental of Thermodynamics	3	E	45	-
EDSU-CPE 219	General Engineering Laboratory I	1	C	-	45
EDSU-CPE 228	Strength of Materials	2	C	30	-
EDSU-CPE 229	General Engineering Laboratory II	1	C	-	45
	Sub Total (1 Elective)	**9**			
Total		**35**			

300 Level

Course Code	Course Title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
GET 301	Engineering Mathematics III	3	C	45	-
GET 302	Engineering Mathematics IV	3	C	45	-
GET 304	Engineering Communication, Technical Writing and Presentation	3	C	45	-
GET 305	Engineering Statistics and Data Analytics	3	C	45	-
GET 306	Renewable Energy Systems and Technologies	3	C	30	45
CPE 301	Computer Organisation and Architecture	2	C	30	-
CPE 302	Measurement and Instrumentation	3	E	30	45
CPE 307	Assembly Language Programming	2	C	45	-
EEE 321	Analogue Electronic Circuits	2	E	15	45
EEE 322	Digital Electronic Circuits	2	E	30	
GET 399	SIWES II: Students Work Experience Scheme	4	C	12 Weeks	
	Sub Total (3 Electives)	**23**			
EDSU-CPE 319	Computer Engineering Laboratory and Design I	1	C	-	45
EDSU-CPE 329	Computer Engineering Laboratory and Design II	1	E	-	45
EDSU-CPE 311	Computer Networks and Communications	2	C	30	-
EDSU-CPE 323	Operating System and Concepts	2	C	30	-
EDSU-CPE 312	Data Structure, Object-Oriented Programming and Algorithm Development	2	C	30	-
EDSU-CPE 324	Distributed Systems	2	C	30	
EDSU-CPE 315	Electric Circuit Design and Applications	2	E	30	
EDSU-ENT321	Entrepreneurial Skills (Practical course)	1	C	-	30
	Sub Total (2 Electives)	**10**			

	Total	**33**		

400 Level

Course Code	Course Title	Units	Status	LH	PH
CPE 401	Microprocessor and Embedded Systems	3	C	30	45
CPE 403	Control System	2	C	30	-
CPE 405	Fundamentals of Software Engineering	2	C	30	-
CPE 411	Hardware Design Techniques and Verification	2	E	30	-
CPE 413	Research Methods	2	E	30	-
GET 499	SIWES III: Students Work Experience Scheme	8	C	24 Weeks	
	Sub Total (2 Electives)	**11**			
30% EDSU Addition					
EDSU-CPE 419	Computer Engineering Laboratory and Design III	1	E	-	45
EDSU-CPE 416	Business Information and Intelligence	2	C	30	-
EDSU-CPE 417	Communication Engineering Principles and Applications	2	C	30	-
EDSU-CPE 418	Internet of Things (IoT) and Cloud Computing	2	C	30	-
EDSU-CPE 412	Artificial Intelligence (AI) and Knowledge Engineering	2	C	30	-
EDSU-CPE 415	Biomedical Engineering and Bioinformatics	2	C	30	-
	Sub Total	**10**			
	Total	**21**			

SIWES Courses

Course Code	Course Title	Units	Status	LH/PH
GET 299	SIWES I: SWEP	3	C	9 weeks
GET 399	SIWES II	4	C	12 weeks
GET 499	SIWES III	8	C	24 weeks
	Total	**15**		

500 Level

Course Code	Course Title	Units	Status	LH	PH
GET 501	Engineering Project Management	3	C	45	-
GET 502	Engineering Law	2	C	30	-
CPE 501	Testing, Reliability and Maintainability	2	C	30	-
CPE 502	Digital Signal Processing	3	C	45	-
CPE 505	Digital System Design with VHDL	2	E	30	-
CPE 511	Machine Learning and Applications	3	C	45	-
CPE 514	Professional Practice and Ethics	2	E	30	-
GET 599	Final Year Project	6	C	-	270
	Sub Total	**19**			
EDSU-CPE 512	Information System: Database Creation & Management	2	E	15	45
EDSU-CPE 513	Mobile & Web Apps Development	2	E	15	45
EDSU-CPE 515	Robotics and Cyber Physical systems Engineering	3	C	15	45
EDUS-CPE 516	Introduction to Cyber Security and Cyberpreneurship	2	E	30	-
EDSU-CPE 517	Operations Research	2	E	30	-

EDSU-CPE 518	Advance Machine Learning Applications	2	E	15	45
EDSU-ENT 421	Entrepreneurship Development	1	C	30	-
	Sub Total (2 Electives)	**10**			
	Total	**29**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, 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 Contents
Sounds and sound patterns in English Language (vowels and consonants, phonetics and phonology); English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations); major word formation processes; the sentence in English (types: structural and functional); grammar and usage (tense, concord and modality). Reading and types of reading, comprehension skills, 3RsQ. Logical and critical thinking; reasoning methods (logic and syllogism, inductive and deductive argument, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities (pre-writing (brainstormingand outlining), writing (paragraphing,punctuation and expression), post- writing (editing and proofreading). Types of writing (summary, essays, letter, curriculum vitae, report writing, note-making). etc. Mechanics of writing. Information and Communication Technology in modern language learning. Language skills for effective communication. The art of public speaking.

GST 112: Nigerian Peoples and Cultures (2 Units C: LH 30)

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. list possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents
Nigerian history, culture and art up to 1800 (Yoruba, Hausa and Igbo peoples and cultures; peoples and cultures of the minority ethnic groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914; formation of political parties in Nigeria; nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian Civil War). Concepts of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigerian peoples; trade, skill acquisition and self-reliance). Social justice and national development (definition and classification of law); Judiciary and fundamental rights. Individuals, norms and values (basic Nigerian norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts [Cultism, kidnapping and other related social vices]). Re-orientation, moral and national values (The 3Rs – Reconstruction, Rehabilitation and Re-orientation; re-orientation strategies: Operation Feed the Nation (OFN), Green Revolution, Austerity Measures, War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (2 Units C: LH 30)

Learning Outcomes
At the end of the course 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 Contents
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 argand diagram. De-Moiré's theorem, n^{th} roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. identify the types of rules in differentiation and integration;
2. recognise and understand the meaning of function of a real variable, graphs, limits and continuity;
3. solve function of a real variable, plot relevant graphs, identify limits and idea of continuity;
4. identify the derivative as limit of rate of change;
5. identify techniques of differentiation and perform extreme curve sketching;
6. identify integration as an inverse of differentiation;
7. identify methods of integration and definite integrals;
8. solve some applications of definite integrals in areas and volumes; and
9. perform integration application to areas, volumes.

Course Contents
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).

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes
On completion, 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 Contents
Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton's laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.

PHY 102: General Physics II (2 Units C: LH 30)

Learning Outcomes
On completion, 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; and
6. describe and determine the effect of forces and deformation of materials and surfaces.

Course Contents
Heat and temperature, temperature scales; gas laws; general gas equation; thermal conductivity; first law of thermodynamics; heat, work and internal energy, reversibility;

thermodynamic processes; adiabatic, isothermal, isobaric; second law of thermodynamics; heat engines and entropy, Zero's law of thermodynamics; kinetic theory of gases; molecular collisions and mean free path; elasticity; Hooke's law, Young's shear and bulk moduli; hydrostatics; pressure, buoyancy, Archimedes' principles; Bernoullis equation and incompressible fluid flow; surface tension; adhesion, cohesion, viscosity, capillarity, drops and bubbles.

PHY 107: General Practical Physics I (1 Unit C: PH 45)

Learning Outcomes
On completion, the student 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 Contents
This introductory course emphasizes quantitative measurements. Experimental techniques. The treatment of measurement errors. Graphical analysis. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc. (covered in PHY 101, 102, 103 and PHY 104). However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

PHY 108: General Practical Physics II (1 Unit C: PH 45)

Learning Outcomes
On completion, the student 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 Contents
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.

GET 101: Engineer in Society (1 Unit C: LH 15)

Learning Outcomes
At the end of this course, the students should be able to:
1. differentiate between science, engineering and technology, and relate them to innovation;
2. distinguish between the different cadres of engineering – engineers, technologists, technicians and craftsmen and their respective roles and competencies;
3. identify and distinguish between the relevant professional bodies in engineering;

4. categorise the goals of global development or sustainable development goals (SDGs); and
5. identify and evaluate safety and risk in engineering practice.

Course Contents
History, evolution and philosophy of science. engineering and technology. The engineering profession – engineering family (engineers, technologists, technicians and craftsmen), professional bodies and societies. Engineers' code of conduct and ethics, and engineering literacy. Sustainable development goals (SDGs), innovation, infrastructures and nation building - economy, politics, business. Safety and risk analysis in engineering practice. Engineering competency skills – curriculum overview, technical, soft and digital skills. Guest seminars and invited lectures from different engineering professional associations.

GET 102: Engineering Graphics and Solid Modelling I (2 Units C: LH15; PH45)

Learning Outcomes
At the end of this course, the students should be able to:
1. have a good grasp of design thinking and be obsessed with the determination to apply such to solving simple every day and also complex problems;
2. recognise the fundamental concepts of engineering drawing and graphics;
3. show skills to represent the world of engineering objects in actionable solid models, and put such models in a form where they can be inputs for simulation and analyses;
4. analyse such models for strength and cost;
5. prepare the objects for modern production and manufacturing techniques of additive and subtractive manufacturing;
6. recognise that engineering is multidisciplinary in the sense that mechanical, electrical and other parts of physical structures are modelled in context as opposed to the analytical nature of the courses they take; and
7. analyse and master the basics of mechanical and thermal loads in engineering systems.

Course Contents
Introduction to design thinking and engineering graphics. First and third angle orthogonal projections. Isometric projections; sectioning, conventional practices, conic sections and development. Freehand and guided sketching – pictorial and orthographic. Visualisation and solid modelling in design, prototyping and product-making. User interfaces in concrete terms. Design, drawing, animation, rendering and simulation workspaces. Sketching of 3D objects. Viewports and sectioning to shop drawings in orthographic projections and perspectives. Automated viewports. Sheet metal and surface modelling. Material selection and rendering. This course will use latest professional design tools such as fusion 360, solid works, solid edge or equivalent.

CPE 111: Introduction to Computer Engineering (2 Units C: LH 30)

Learning Outcomes
At the end of the course the student should be able to:
1. represent and manipulate information in binary form in a written and readable form;
2. design, physically implement, and debug basic combinational and sequential logic circuits;
3. write structural and data flow models of logic circuits in a hardware description language;
4. implement designs represented in a register transfer language;
5. discuss and explain the organisation and operation of a basic digital computer;
6. describe the execution of machine language computer programmes by a basic computer

in writing or flow chart;
7. write elementary assembly language programmes and discuss their translation to machine language programmes;
8. use Boolean algebra or K-maps to simplify complex Boolean expressions;
9. convert numbers between any two number systems, especially decimal, binary, octal and hex and represent sign numbers;
10. design arithmetic circuits to perform addition and subtraction of signed numbers and detect overflow conditions;
11. implement functions using AND/OR gates, OR/AND gates, NORs only, NANDs only, multiplexers or decoders.
12. design the basic flip flops using sequential logic;
13. design, implement and test a simple circuit based on a specified word problem;
14. programme simple microcontrollers in assembly language; and
15. identify a local environment-related need, write and present group reports on hardware and software design projects using cooperative learning approach (learning team work in problem solving and improvisation).

Course Contents

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,

EDSU-CPE 111: General Chemistry I (2 Units C: LH 30)

Senate-approved relevance

As a preparatory course for engineering students, this course is in line with EDSU's mission for quality education for the development of high-quality engineering. This course helps to bring students to understand how computers work on a fundamental level. By understanding the principles of chemistry, computer engineers can develop more efficient and powerful computers. General Chemistry also plays a vital role in the development of new computer technologies. For example, chemists are working on developing new materials that can be used to create faster and more powerful processors.

Course Overview

The study of General Chemistry is an exploration of key areas of chemistry needed for engineers. The knowledge base world builds a sound and solid foundation for EDSU graduate of computer engineering in designing solutions that matches up to industries demands and standards: Electrons make up the building blocks of a complete computer system. This subject shows us how to research, manage them, and create new materials of better quality and lower cost. The study of semiconductors will be even more advantageous with the help of chemistry.
This course covers the elementary principles and theories of chemistry; Intermolecular forces, liquids, solids, solutions, kinetics, equilibria, acids and bases, the nature of matter, gases, liquids and solids, energy, atomic theory, properties of elements, chemical bonding, molecular structure and properties, stoichiometry, thermochemistry, and solutions.

Objectives

The objectives of the course are to:
1. describe atoms and atomic structure
2. describe molecule and chemical reactions

3. discuss the principles of atomic and molecular theory, stoichiometry, and thermodynamics.
4. describe methods of data analysis, interpretation, and application
5. discuss chemical bonding and types of reaction

Learning Outcomes

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

1. explain atoms and atomic structure
2. explain molecule and chemical reactions
3. state the principles of atomic and molecular theory, stoichiometry, and thermodynamics.
4. demonstrate methods of data analysis, interpretation and application
5. explain chemical bonding and types of reaction

Course Contents

Introduction to atom and structure of Atoms. Components of atoms. Chemical reactions. Modern electronic theory of atoms. Electronic configuration and periodicity. 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.

EDSU-CPE 121: General Chemistry II (2 Units C: LH 30)

Senate-approved relevance

This course is an advancement on General Chemistry I. Advances in chemistry, enable computer engineers to be where they are today: Chemistry and computers have been used to optimize motor vehicles and create solar cells. Regardless of the source of the problem, a computer engineer's mind must be flexible and aware of the fundamental unity of problem-solving techniques. Chemistry can, in other words, help EDSU students think systematically and solve problems in a systematic manner. The course General Chemistry plays an important role in discovering and understanding of materials in many computer components and computer-aided devices. In the emerging field of nanotechnology and nanoscience, it is vital for computer engineers to be able to manage the structure and bonding of molecules that are important in making electronic components for products such as computers.

Course Overview

The study of General Chemistry is an exploration of key areas of chemistry needed for engineers. The knowledge base would build a sound and solid foundation for EDSU graduate of computer engineering in designing solutions that matches industries' demands and standards: Electrons make up the building blocks of a complete computer system. This subject shows us how to research, manage them, and create new materials of better quality and lower cost. The study of semiconductors will be even more advantageous with the help of chemistry.

This course covers the qualitative and quantitative aspects of scientific measurement precipitation, thermodynamics, electrochemistry, organic chemistry, and nuclear chemistry.

Objectives

The Objectives of the Course are to:

1. discuss the importance and development of organic chemistry
2. describe of electronic theory and basic properties of transition metals
3. discuss the qualitative and quantitative structure of organic chemistry

4. discuss the rule guiding non-molecular and functional group classes of organic chemistry
5. discuss the rate and mechanisms of reactions
6. describe the chemistry of group IA, IIA, and IVA elements

Learning Outcomes

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

1. explain the importance and development of organic chemistry
2. state of electronic theory and basic properties of transition metals
3. differentiate between the qualitative and quantitative structure of organic chemistry
4. state the rule guiding non-molecular and functional group classes of organic chemistry
5. explain the rate and mechanisms of reactions
6. compare the chemistry of group IA, IIA, and IVA elements

Course Contents

Historical survey of the development and importance of organic chemistry. Fullerenes as the fourth allotrope of carbon. Uses as nanotubules. Nanostructures and nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds. Qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes and alkynes. The chemistry of alcohols, ethers, and amines. The chemistry of alkyl halides, nitriles, and aldehydes. The chemistry of ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA, and IVA elements. Introduction to transition metal chemistry.

EDSU-CPE 112: General Practical Chemistry I (0 Unit C: PH 45)

Senate-Approved Relevance

Training of highly skilled graduates who are knowledgeable in the practical demonstration experiments in Chemistry is in agreement with EDSU's mission to address the challenges in producing highly skilled practically oriented Computer engineers from EDSU to be able to conduct experiments relating to knowledge on electronic and computer components which is of immediate value to the industry.

Overview

Laboratory practical is at the core of every engineering discipline. Every experiment exposes students to the proper application of laboratory apparatus, specimens, safety tips, and precautions. General practical chemistry is a course designed to introduce students to a practical understanding of chemistry and further deepen their knowledge of laboratory experiments in general.

In this course, students will learn experimental techniques, which will act as a basis for laboratory experiments, they will meet at the higher levels in the computer engineering program. We will also describe the apparatus required for various experiments, in addition to the common laboratory apparatus with which you are already familiar. Safety in the laboratory and the preparation of a laboratory notebook are very important aspects of any laboratory course. We will, therefore, first of all, describe the safety measure, which you should always take cognizance of in a chemistry laboratory; and how to prepare a laboratory notebook.

Objectives

The Objectives of the Course are to:

1. discuss general laboratory rules and safety procedures

2. extract scientific data and correctly carry out chemical experiments
3. identify the basic glassware and equipment in the laboratory
4. discuss the primary and secondary standards
5. highlight all observations and measurements in the laboratory notebooks
6. establish the scientific conclusions by analysing the data from laboratory experiments

Learning Outcomes

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

1. state Five (5) laboratory rules and safety procedures
2. gather scientific data and correctly carry out chemical experiments
3. distinguish the basic glassware and equipment in the laboratory
4. differentiate between the primary and secondary standards
5. highlight all observations and measurements in the laboratory notebooks
6. recall the scientific conclusions of analysed data during laboratory experiments

Course Contents

Apparatus and experimental Techniques. Units of Measurement. Acid-base titrations. Qualitative analysis. Redox reactions. Gravimetric analysis. Data analysis and presentation. Making measurements, cautions, and anions. Preparation of standard solutions. Standardizing solutions. Stoichiometry. Volumetric analysis. Redox titration. Acid-Base II Standardization of a non-standard solution. Acid-Base determination of percent purity of a substance. Acid-Base IV determination of the concentration of a substance in excess. Back Titration.

EDSU-CPE 122: General Practical Chemistry II (0 Unit C: PH 45)

Senate-Approved Relevance

Training of highly skilled graduates who are knowledgeable in the practical demonstration experiments in Chemistry is in agreement with EDSU's mission to address the challenges in producing highly skilled practically oriented Computer engineers from EDSU being able to conduct experiments relating to knowledge on electronic and computer components which is of immediate value to the industry.

Overview

Laboratory practical is at the core of every engineering discipline. Every experiment exposes students to the proper application of laboratory apparatus, specimens, safety tips, and precautions. General practical chemistry is a course designed to introduce students to a practical understating of chemistry and further deepen their knowledge of laboratory experiments in general.

In this course, students will learn experimental techniques, which will act as a basis for laboratory experiments, they will meet at the higher levels in the computer engineering program. We will also describe the apparatus required for various experiments, in addition to the common laboratory apparatus with which you are already familiar. Safety in the laboratory and the preparation of a laboratory notebook are very important aspects of any laboratory course. We will, therefore, first of all, describe the safety measure, which you should always take cognizance of in a chemistry laboratory; and how to prepare a laboratory notebook. We will elaborate on the exposures outlined, laboratory works and experiments of EDSU-CPE 112. Adequate focus would be given to conducting Laboratory work on various topic areas covered in EDSU-CPE 122.

Objectives

The Objectives of the Course are to:

1. discuss general laboratory rules and safety procedures

2. extract scientific data and correctly carry out chemical experiments
3. identify the basic glassware and equipment in the laboratory
4. perform preliminary tests such as ignition, boiling point, melting point, test on known and unknown organic compounds
5. Perform solubility, elemental functional group/confirmatory tests on known and unknown organic compounds

Learning Outcomes

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

1. state Seven (7) laboratory rules and Five (5) safety procedures
2. gather scientific data and correctly carry out chemical experiments
3. distinguish the basic glassware and equipment in the laboratory
4. conduct preliminary tests which include ignition, boiling point, melting point, test on known and unknown organic compounds
5. conduct solubility tests on known and unknown organic compounds

Course Contents

Functional group analysis. Quantitative analysis using volumetric methods. Acid-base V Determination of the amount of NaOH and Na2CO3 in a mixture (Double indicator method). Oxidation-Reduction Reactions. Redox titration II: Use of Potassium Permanganate as an Oxidant. Redox Titration III: Use of Potassium Permanganate as an Oxidant. Redox Titration IV: Use of Potassium Permanganate as an Oxidant. Redox (Reactivity) Series in Metals. Energy effects of Chemical reactions. Spectroscopic experiments: mass, Infrared, Nuclear Magnetic Resonance, ultraviolet spectroscopy. Column separation. Vibration of a diatomic. Stereochemistry. Organic compounds. Quantum numbers. Atomic Mass elements. Periodic Elements. Balancing chemical equations. Salt analysis.

EDSU-CPE 113: Elementary Mathematics III (Vectors, Geometry and Dynamics) (2 Units C: LH 30)

Senate-Approved Relevance

To meet the EDSU mission of developing high-quality skilled manpower for solving complex problems using engineering principles, Elementary Mathematics, which exposes students to solving engineering problems with vector notations, geometry, and dynamics is a necessary requirement. This course will also align EDSU's mission with the objectives of SDG goals 4 and 9.

Overview

Grooming of competent and industrial-oriented Engineers who are self-reliant and able to output products that will compete in the global market aligns perfectly with the vision of Edo State University Uzairue. This course as it were "Elementary Mathematics III (Vectors, Geometry, and Dynamics)" has been structured to introduce and develop mathematical techniques that are key to many applications in Computer Engineering. Therefore, the course is structured to expose students to the skills required in other to attain a level of proficiency in sciences, technology, and Engineering Professions.

Elementary Mathematics III (Vectors, Geometry, and Dynamics) is designed to teach you how mathematics could be used in solving problems in the contemporary Scientific world. Therefore, the course is structured to expose you to the skills required in other to attain a level of proficiency in sciences, technology, and Engineering Professions.

Objective

The Objectives of the Course are to:

1. describe vectors, geometrical representation of vectors, and components of vectors
2. describe the linear dependence of vectors, simple application
3. discuss Force, momentum, laws of motion under gravity, projectiles, and resisted vertical motion.
4. discuss Torque and Angular momentum
5. describe Simple harmonic motion

Learning Outcomes

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

1. illustrate vectors, geometrical representation of vectors, and components of vectors
2. explain the linear dependence of vectors, simple application
3. state Force, momentum, laws of motion under gravity, projectiles, and resisted vertical motion.
4. distinguish between torque and Angular momentum
5. explain Simple harmonic motion

Course Contents

Geometric representation of vectors in 1-3 dimensions. Components. Direction cosines. Addition and scalar multiplication of vectors. 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. Tangents and normal. Kinematics of a particle. Components of velocity and acceleration of a particle in a plane. Forces and momentum. Laws of motion under gravity. Projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse and impact of two smooth spheres and a sphere on a smooth surface.

200 Level

GST 212: Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes

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

1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments,

logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.; introduction to basic design and operation of digital computers (information representation.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 30)

Learning Outcomes

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

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation and risk-taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment generation and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe the stages in enterprise formation, partnership and networking, including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents

The concept of entrepreneurship (entrepreneurship, intrapreneurship/ corporate entrepreneurship); theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship, and creative destruction); characteristics of entrepreneurs (opportunity seeker, risk-taker, natural and nurtured, problem solver and change agent, innovator and creative thinker); entrepreneurial thinking (critical thinking, reflective thinking and creative thinking). Innovation (The concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership and networking (basics of business plan, forms of business ownership, business registration and alliance formation, and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office and networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

GET 201: Applied Electricity I (3 Units C: LH 45)

Learning Outcomes

Students will be able to:

1. discuss the fundamental concepts of electricity and electrical d.c. circuits;
2. state, explain and apply the basic d.c. circuit theorems;
3. explain the basic a.c. circuit theory and
4. apply to solution of simple circuits.

Course contents

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 - notation, AC circuits, impedance, admittance, acceptance.

GET 202: Engineering Materials (3 Units C: LH 45)

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 classify polymers as a class of engineering materials and polymeric materials, demonstrate polymerisation reactions, their types and mechanism, and applications of polymers;
6. define 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 factors affecting the performance and service life of engineering
9. 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 Contents

The material science; atomic structure, atomic bonding and crystal structures. Engineering materials situating metals and alloys; metals and alloys, classifications of metals, metal extraction processes using iron and steel (ferrous) and aluminium (nonferrous) as examples, phase diagrams/iron carbon diagrams, and mechanical workings of metals. Selection and applications of metals and alloys for specific applications in oil, aerospace, construction, manufacturing and transportation industries, among others. Ceramics (including glass); definition, properties, structure and classifications of ceramics. Bioactive and glass – ceramics. Toughing mechanism for ceramics. Polymers: definition of polymers as engineering materials; chemistry of polymeric materials, polymer crystallisation, polymer degradation and aging. Thermoplastic and thermosetting polymers and concepts of copolymers and homopolymers. Composites; definition, classification, characterisation, properties and composite. Applications of composites. Nanomaterials; definition, classification and applications of nanomaterials as emerging technology. Processing of nanomaterials including mechanical grinding, wet chemical synthesis, gas phase synthesis, sputtered plasma processing, microwave plasma processing and laser ablation. Integrity assessment of engineering materials; effect of engineering design, engineering materials processing, selection, manufacturing and assembling on the performance and service life of engineering materials. Metallography and fractography of materials.

Mechanical testing (destructive testing) of materials such as compressive test, tensile test, hardness test, impact test, endurance limit and fatigue test. Non-destructive test (NDT) such as dye penetrant, x-ray and eddy current.

GET 204: Students Workshop Practice (2 Units C: LH 15; PH 45)

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. master workshop and industrial safety practices, accident prevention and ergonomics;
4. physically recognise different electrical & electronic components like resistances, inductances, capacitances, diodes, transistors and their ratings;
5. connect electric circuits, understand different wiring schemes, and check ratings of common household electrical appliances and their basic maintenance; and
6. determine household and industrial energy consumption, and understand practical energy conservation measures.

Course Contents

The course comprises general, mechanical and electrical components: supervised hands-on experience in safe usage of tools and machines for selected tasks; Use of measuring instruments (calipers, micrometers, gauges, sine bar, wood planners, saws, sanders, and pattern making). Machine shop: lathe work shaping, milling, grinding, reaming, metal spinning. Hand tools, gas and arc welding, cutting, brazing and soldering. Foundry practice. Industrial safety and accident prevention, ergonomics, metrology. Casting processes. Metal forming processes: hot-working and cold-working processes (forging, press-tool work, spinning, etc.). Metal joining processes (welding, brazing and soldering). Heat treatment. Material removal processes. machine tools and classification. Simple theory of metal cutting. Tool action and cutting forces. Introduction to CNC machines. Supervised identification, use and care of various electrical and electronic components such as resistors, inductors, capacitors, diodes and transistors. Exposure to different electric circuits, wiring schemes, analogue and digital electrical and electronic measurements. Household and industrial energy consumption measurements. Practical energy conservation principles.

GET 209: Engineering Mathematics I (3 Units C: LH 45)

Learning Outcomes

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

1. solve qualitative problems based on vector and matrix analyses such as linear independence and dependence of vectors, rank etc;
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. analyse 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 Contents
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.

GET 210: Engineering Mathematics II (3 Units C: LH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. describe physical systems using ordinary differential equations (ODEs);
2. explain 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 Contents
Introduction to ordinary differential equations (ODEs); theory, applications, methods of solution; second order differential equations. Advanced topics in calculus (vectors and vector-valued function, line integral, multiple integral and their applications). Elementary complex analysis including functions of complex variables, limits and continuity. Derivatives, differentiation rules and differentiation of integrals. Cauchy-Riemann equation, harmonic functions, basic theory of conformal mapping, transformation and mapping and its applications to engineering problems. Special functions.

GET 211: Computing and Software Engineering (3 Units C: LH 30; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. describe and apply computing, software engineering knowledge, best practices, and standards appropriate for complex engineering software systems;
2. develop competence in designing, evaluating, and adapting software processes and software development tools to meet the needs of an advanced development project through practical object-oriented programming exposure taught in concrete terms with

a specific modern language – preferable selected from Python, Java or C++;
3. use widely available libraries to prepare them for machine learning, graphics and design simulations;
4. develop skills in eliciting user needs and designing an effective software solution;
5. recognise human, security, social, and entrepreneurial issues and responsibilities relevant to engineering software and the digitalisation of services; and
6. acquire capabilities that can further be developed to make them productively employable by means of short Internet courses in specific areas.

Course Contents
Introduction to computers and computing; computer organisation – data processing, memory, registers and addressing schemes; Boolean algebra; floating-point arithmetic; representation of non-numeric information; problem-solving and algorithm development; coding (solution design using flowcharts and pseudo codes). Data models and data structures; computer software and operating system; computer operators and operators' precedence; components of computer programs; introduction to object oriented, structured and visual programming; use of MATLAB in engineering applications. ICT fundamentals, Internet of Things (IoT). Elements of software engineering.

GET 299: Students Industrial Work Experience I (3 Units C: 9 weeks)

Learning Outcomes
SIWES I should provide opportunity for the students to:
1. acquire industrial workplace perceptions, ethics, health and safety consciousness, inter- personal skills and technical capabilities needed to give them a sound engineering foundation;
2. learn and practise basic engineering techniques and processes applicable to their specialisations;
3. build machines, devices, structures or facilities relevant to their specific engineering programmes and applications; and
4. acquire competence in technical documentation (log-book) and presentation (report) of their practical experiences.

Course Contents
Practical experience in a workshop or industrial production facility, construction site or special centres in the university environment, considered suitable for relevant practical/ industrial working experience but not necessarily limited to the student's major. The students are exposed to hands-on activities on workshop safety and ethics, maintenance of tools, equipment and machines, welding, fabrication and foundry equipment, production of simple devices; electrical circuits, wiring and installation, etc. (8-10 weeks during the long vacation following 200 level).

NOTE: Each programme to indicate additional details of programme-specific activities for their students.

EDSU-CPE 222: Applied Electricity II (2 Units C: LH 30)

Senate-approve relevance
Applied electricity provides is a technical area that equips students with the needed skill set to develop the technical ability expected in high-quality skilled engineers. The EDSU mission promotes this height of technical strength, which also pursues to achieve the objectives of goals 4 and 9 of the SDG.

Overview
Basic electricity course is the basis of computer engineering program in modern times. The course will lay a solid foundation for beginners since the computer system basically consists of electrical and electronic components. The course provides basic design requirements to equip the upcoming computer engineer in his hardware design and production skill. Design concepts for electrical circuits and electric power generation are all required in the design and development of computer systems, since they provide the background knowledge of complex problem-solving.

The course Applied Electricity II together with Applied Electricity I, Electronics I: Physical and Analogue, and Engineering Graphics and Solid Modelling II brings to limelight the relevance of all the theoretical courses as well as the Introduction to Computer Engineering Course and provides a platform for its application. The students are exposed to applying all the theoretical knowledge to solve industrial-based problems this is congruence with the senate's objectives of integrating outcome-based education into the learning system.

Objective
The Objectives of this Course are to:
1. identify the dc. and ac. machines
2. explain simple and complex problems involving electric machine design
3. describe electric circuits using basic fundamental laws such as ohm's law
4. demonstrate a critical problem-solving ability for handling complex engineering task
5. design electric circuit involving basic circuit elements

Learning outcomes
Students will be able to:
1. distinguish between dc. and ac. machines
2. solve simple and complex problems involving electric machine design
3. analyse electric circuits using basic fundamental laws such as ohm's law
4. develop a critical problem-solving ability for handling complex engineering task
5. design electric circuit involving basic circuit elements

Course contents
Conductor resistance. Ohm's law. Temperature coefficient of conductors. Introduction to basic DC machines. Synchronous alternators. Transformers design principles. Equivalent circuits. Three-phase balanced circuits. Inductive circuit. Capacitive circuit. Impedance in a circuit. Capacitive circuit. Current lead circuit. Voltage lead circuit. Current lag circuit. Voltage lag circuit. Review of semiconductors. RMS value. Peak voltage. Electrical Power. Electrical Work.

EDSU-CPE 225: Fundamentals of Fluid Mechanics (3 Units C: LH 45)

Senate-approve relevance
Training of competent and industrial-oriented Engineers who are self-reliant and able to output products that will compete in the global market aligns perfectly with the vision of Edo State University Uzairue. This course Fundamentals of Fluid Mechanics has been structured to enable young computer engineering graduates to develop adequate knowledge to engender skills in automation and design to aid fluid mechanics because of the forces that are produced by fluids and which can be used for practical purposes. Some of the well-known examples are jet propulsion, aerofoil design, wind turbines, and hydraulic brakes.

Overview

Fluid flows are important in many scientific and technological problems including atmospheric and oceanic circulation, energy production by chemical or nuclear combustion in engines and stars, energy utilisation in vehicles, buildings, and industrial processes, and biological processes such as the flow of blood. Considerable progress has been made in the mathematical modeling of fluid flows and this has greatly improved our understanding of these problems, but there is still much to discover.

This course is designed to introduce students to the mathematical description of fluid flows and the solution of some important flow problems. The course uses engineering principles such as mathematical analysis and system modeling to expose students to complex engineering problem skills in general. Areas of focus include flow rate, pressure, flow dynamics, etc.

Objective

The Objectives of the Course are to:

1. discuss the properties of fluids
2. determine forces in static fluids and fluids in motion
3. discuss the stability of a floating body
4. determine 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. conduct calculations based on principles of mass, momentum, and energy conservation
7. discuss the dimensional analysis and simple fluid modeling problems
8. describe the type and capacity of pumps and turbines for engineering applications

Learning Outcomes

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

1. explain the properties of fluids;
2. determine forces in static fluids and fluids in motion;
3. determine whether a floating body will be stable;
4. determine 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, and others;
6. perform calculations based on principles of mass, momentum, and energy conservation;
7. perform dimensional analysis and simple fluid modeling problems; and
8. specify the type and capacity of pumps and turbines for engineering applications.

Course Contents

Introduction to fluid mechanics. Properties of Fluid. Introduction to fluid thermodynamics. Vector calculus. Introduction to Kinematics. Fluid dynamics. Laws of energy conservation. Boundary of flow. Ideal flow. The Boundary layer flows. Instabilities. Fluid physics of sustainability. Hydrostatics. Fluid dynamics using principles of mass, momentum, and energy conservation. Flow measurements in pipes. Dimensional analysis and similitude. 2-dimensional flows. Hydropower systems.

EDSU-CPE 226: Fundamentals of Engineering Thermodynamics (3 Units C: LH 45)

Senate-approved relevance

A core engineering course that is tailored in line with EDSU mission and vision of developing competent engineers with high-level skills needed for national economic growth, and towards achieving the objectives of the SDG goals 4 and 9. Training of highly skilled graduates who are

knowledgeable in the subject area of Fundamentals of Engineering Thermodynamics is in agreement with EDSU's mission to exposure in its broader aspect is dedicated to cooling down miniature systems or components of computers such as the processor. The more miniaturized the systems are becoming it is essential for heat removal. Thermodynamics not only just tries to get the cooling system better but it tries to find a way to make quantum computing possible by reducing temperatures to supercooled levels.

Overview

The fundamental knowledge of Engineering thermodynamics provides a bedrock for general engineering knowledge. An understanding of thermodynamics is required for the design of efficient, cost-effective systems for power generation (including energy conversion systems), propulsion (including combustion engines and gas turbines), heat exchangers, industrial processes, refining, and chemical processing. This area of interest is important to many industries—aerospace, defense, automotive, metals, glass, paper, and plastic, as well as to the thermal design of electronic and computer packages. The principles and skills will build a sound and solid foundation for EDSU graduates of computer engineering in meeting industry demand.

This course provides a basic grounding in the principles and methods of Classical Thermodynamics. It concentrates on: understanding the thermodynamic laws in relation to familiar experience; phase change, ideal gas, and flow processes; using sources of data like thermodynamic tables and charts; application of the basic principles to the operation of various engine cycles.

Objective

The Objectives of this Course are 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. determine absolute and gage pressure, and absolute temperature, determine changes in kinetic, potential, enthalpy and internal energy;
4. discuss the properties of pure substances i.e. discuss 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. determine 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. describe heat transfer by conduction, convection and radiation, and determine the amount of heat energy transferred;
7. identify the changes in moving boundary work, spring work, electrical work, and shaft work in closed systems;
8. define the first law of thermodynamics for closed systems and explain the conservation of mass and energy equations;
9. describe the first law of thermodynamics to the open systems i.e. describe the 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. discuss energy and mass balance for unsteady-flow processes;
11. explain thermodynamic applications using the second law of thermodynamics;
12. determine thermal efficiency and coefficient of performance for heat engine, refrigerators and heat pumps; and
13. state perpetual-motion machines, reversible and irreversible processes.

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 the conservation of mass and energy equations;
9. formulate the first law of thermodynamics to the open systems i.e. describe the 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 the 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 Contents

Basic concepts and definitions (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. The Second law of thermodynamics. Heat cycles and efficiencies.

EDSU-CPE 219: General Engineering Laboratory I (1 Unit C: LH 15)

Senate-Approved Relevance

Training of highly skilled graduate who are knowledgeable in the practical demonstration experiments in to engineering graphics and the concepts of engineering design are in agreement with EDSU's mission to address the challenges in producing highly skilled practically oriented computer engineers from EDSU being able to conduct experiment relating to engineering graphics and the concepts of engineering design which is of immediate value to the industry.

Overview

This is to be conducted in the General Engineering workshops/Laboratories by all Computer Engineering students who have completed a minimum of two semesters in the program.

Students will perform various hand and machine tool operations under staff supervision. It includes a general introduction to engineering materials, and selected practices on laying-out and setting out a job, using measuring devices.

Computer Engineering Laboratory sessions should cover an introduction to engineering graphics and the concepts of engineering design. Includes sketching, dimensioning practices and tolerances, computer-aided design (CAD), basic part modeling, and three-dimensional (3D) assembly modeling. At the end of the training, students will be required to complete a report regarding their training.

Course Objective

The objectives of this course are to:

1. discuss the fundamental concepts of electricity and electrical d.c. circuits;
2. state and apply the basic d.c. circuit theorems;
3. describe the basic a.c. circuit theory
4. determine the solution of simple circuits
5. estimate the stresses and strains in single and composite members due to temperature changes;
6. evaluate the distribution of shear forces and bending moments in beams with distributed and concentrated loads
7. determine bending stresses and their use in identifying slopes and deflections in beams translate their thoughts and excitements to produce shop drawings for multi-physical, multidisciplinary design.
8. demonstrate electronics board layout preparation
9. perform experiments on kinematics of particles and rigid bodies in plane motion.
10. describe simulation for material optimisation

Learning Outcome

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

1. demonstrate the fundamental concepts of electricity and electrical d.c. circuits;
2. demonstrate the basic d.c. circuit theorems;
3. describe the basic a.c. circuit theory
4. demonstrate the solution of simple circuits
5. estimate the stresses and strains in single and composite members due to temperature changes;
6. evaluate the distribution of shear forces and bending moments in beams with distributed and concentrated loads
7. determine bending stresses and their use in identifying slopes and deflections in beams translate their thoughts and excitements to produce shop drawings for multi-physical, multidisciplinary design.
8. demonstrate electronics board layout preparation
9. conduct experiments on the kinematics of particles and rigid bodies in plane motion.
10. explain simulation for material optimisation

Course Contents

Basic Electrical Drawing. Interpretation of Electrical circuits. Experiments involving Thevenin & Norton theorems. AC circuit experiment. DC circuit Experiments. R-C-L circuits. Kirchhoff's Law. Experiment on Hook's Law. Spring test. Compression test. Strain measurement. Moment and equilibrium of forces. Resultant of forces. Newton's second law of motion. Sliding friction. Drawing layout in AutoCAD. Drawing layout in Solid Works. Electrical Drawings in AutoCAD. 3-D drawings in Solid Works.

EDSU-CPE 228: Strength of Materials (2 Units C: LH 30)

Senate-Approved Relevance
Training of highly skilled graduate who are knowledgeable in the subject area of strength of materials are in agreement with EDSU's mission to address the challenges in producing highly skilled practically oriented computer engineers from EDSU with adequate knowledge of electronic components and strength of materials to be able to conduct related experiments which is of immediate value to the industry.

Overview
The strength of a material is its ability to resist external forces without breaking. Strength of Materials is the foundation for Engineering design courses, which prepares engineering students for material testing and selection skills. In computer engineering, the development of physical hardware requires a lot of experience from the strength of materials, plus the design and analytical skills that the course provides.

This course introduces students to the basics of the strength of materials. It is designed to introduce elementary analysis of deformable bodies subjected to various loading including strength, deformation, and stability analyses. Students will also be introduced to more advanced concepts to use sound judgment regarding the design of structures and components.

Course Objective
The Objectives of the Course are to:
1. describe a structural system that is stable and in equilibrium
2. determine the stress-strain relation for single and composite members based on Hooke's law
3. estimate the stresses and strains in single and composite members due to temperature changes
4. analyse the distribution of shear forces and bending moments in beams with distributed and concentrated loads
5. determine bending stresses and their use in identifying slopes and deflections in beams
6. evaluate the normal and shear stresses in a multi-dimensional stress system and transformation of these stresses into strains using Mohr's circle
7. identify the stresses and strains due to torsion on circular members
8. identify the buckling loads of columns under various fixity conditions at the ends

Learning Outcomes
At the end of this course, the students should be able to:
1. distinguish a structural system that is stable and in equilibrium
2. distinguish the stress-strain relation for single and composite members based on Hooke's law
3. estimate the stresses and strains in single and composite members due to temperature changes
4. evaluate the distribution of shear forces and bending moments in beams with distributed and concentrated loads
5. distinguish bending stresses and their use in identifying slopes and deflections in beams
6. evaluate the normal and shear stresses in a multi-dimensional stress system and transformation of these stresses into strains using Mohr's circle
7. distinguish the stresses and strains due to torsion on circular members
8. determine the buckling loads of columns under various fixity conditions at the ends

Course Contents

Consideration of equilibrium. Composite members. Stress-strain relation. Generalised Hooke's law. Stresses and strains due to loading and temperature changes. Torsion of circular members. Shear force. Bending moments. Bending stresses in beams with symmetrical and combined loadings. Stress and strain transformation equations and Mohr's circle. Elastic buckling of columns. Introduction to statistical indeterminacy and simple redundant structures. Work and strain energy concepts. Deflections of beams. Euler buckling. Short and long columns. Torsion of solid and hollow circular sections.

EDSU-CPE 229: General Engineering Laboratory II (1 Unit C: PH 45)

Senate-approved Relevance

Training of highly skilled graduate who are knowledgeable in the practical demonstration experiments in to engineering graphics and the concepts of engineering design are in agreement with EDSU's mission to address the challenges in producing highly skilled practically oriented computer engineers from EDSU being able to conduct experiment relating to engineering graphics and the concepts of engineering design which is of immediate value to the industry.

Overview

This is to be conducted in the General Engineering workshops/Laboratories by all Computer Engineering students who have completed a minimum of two semesters in the program. Students will perform various laboratory sessions under staff supervision. It includes engaging in experience techniques and methods employed in industrial electrical system troubleshooting and how to select and maintain reliable system components & materials while using approved standards.

Various Computer Engineering Laboratory sessions should cover a variety of hands-on computing and Software Engineering design tools. At the end of the training, students will be required to complete a report regarding their laboratory work and training.

This course builds professional competencies as it extends prior knowledge from both Physical and Analogue Electronics and Computer Software Engineering, as well as the thermodynamics and fluid mechanics sciences. Value-added education can be obtained as the student will clearly understand principles related to two general engineering fields together with that of core Electronic and Computer Engineering through the demonstration of the experiments involved in this course. Written laboratory reports for each experiment will also enhance communications abilities and data analyses and build technology competencies. Clearly, this course will help EDSU students in critical thinking and problem-solving and will enhance the development of knowledge, and skills for competency in the fields of Computer Engineering.

Course Objective

The objectives of this course are to:

1. develop practical skills across different basic engineering disciplines
2. discuss laboratory safety tips and precautions against work hazards
3. describe the workings of the laboratory experiments
4. describe the techniques of technical report writing
5. develop the equipment and tools handling skill

Course Learning Outcome

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

1. conduct practical skills across different basic engineering disciplines

2. compare laboratory safety tips and precautions against work hazards
3. demonstrate the workings of the laboratory experiments
4. demonstrate the techniques of technical report writing
5. demonstrate the equipment and tools handling skill

Course Contents

Basic laboratory instrumentation. Health and Safety rules. Hazards in the laboratories. Data acquisition methods. Laboratory reports technique. Tools handling. Fundamentals of Fluid Mechanics. Fundamentals of Engineering Thermodynamics. Physical and Analogue design. Computing and Software Engineering design. Industrial electrical system troubleshooting. Selection of reliable system components. Maintenance of reliable system components. Material handling in the laboratory. Software Engineering design tools. Data analyses strategy. Statistical methods for research. Electrical Circuit Drafting and Interpretation.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes

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

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

Course Contents

The concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, economic, geo-political Conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory; root causes of conflict and violence in Africa: indigene and settlers phenomenon, boundaries/boarder disputes, political disputes, ethnic disputes and rivalries, economic inequalities, social disputes, nationalist movements and agitations; selected conflict case studies – Tiv-Junkun, ZangoKartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security: Peace & Human Development. Approaches to Peace & Conflict Management (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution: Conflict dynamics assessment Scales: Constructive & Destructive. Justice and Legal framework: Concepts of Social Justice; The Nigeria Legal System. Insurgency and terrorism. Peace mediation and peace keeping. Peace and Security Council (international, national and local levels). Agents of conflict resolution – Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution (ADR) (dialogue, arbitration, negotiation, collaboration, etc). The roles of international organizations in conflict resolution ((a) The United Nations, UN and its conflict resolution organs. (b) The African Union & Peace Security Council (c) ECOWAS in peace keeping). The media and traditional institutions in peace building. Managing post- conflict situations/crises: Refugees. Internally Displaced Persons (IDPs); the role of NGOs in post-conflict situations/crises.

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors, regardless of geographical location;
3. state how original products, ideas and concepts are developed;
4. develop a business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises;
7. conduct entrepreneurial marketing and e-commerce;
8. apply a wide variety of emerging technological solutions to entrepreneurship; and
9. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilized resources, social and climate conditions and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro-finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, First Mover Advantage, E-commerce business models and successful e-commerce companies). Small business management/family business: Leadership & Management, basic book keeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (The concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - artificial intelligence (AI), virtual/mixed reality (VR), Internet of things (IoTs), blockchain, cloud computing, renewable energy, etc. Digital business and e-commerce strategies).

GET 301: Engineering Mathematics III (3 Units C: LH 45)

Learning Outcomes

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

1. demonstrate a clear understanding of the course content, that is, possess a breadth of knowledge in the area covered;
2. possess an in-depth knowledge upon which a solid foundation can be built in order to demonstrate a depth of understanding in advanced mathematical topics;
3. develop simple algorithms and use computational proficiency;
4. write simple proofs for theorems and their applications; and
5. communicate the acquired mathematical knowledge effectively in speech, writing and collaborative groups.

Course Contents

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.

GET 302: Engineering Mathematics IV (3 Units C: LH 45)

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 Contents

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 separation of 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.

GET 304: Technical Writing and Communication (3 Units C: LH 45)

Learning Outcomes

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

1. demonstrate the concept of clear writing, common pitfalls and unambiguous language in engineering communication, including technical reporting for different applications and emotional comportment;
2. demonstrate the skills of language flexibility, formatting, logic, data presentation styles, referencing, use of available aids, intellectual property rights, their protection, and problems in engineering communication and presentation; and
3. demonstrate good interpersonal communication skills through hands-on and constant practice on real-life communication issues for engineers in different sociocultural milieu for engineering designs, structural failure scenarios and presentation of reports.

Course Contents

A brief review of common pitfalls in writing. Principles of clear writing (punctuations and capitalization). Figures of speech. Units of grammar. Tenses and verb agreement. Active and passive sentences Lexis, structure Fog and Index concept. Skills for communication and communication algorithm. Types and goals of communication; Interpersonal communication; features and the Finger Model or A, B, C, D, E of good interpersonal communication (accuracy of technical terms, brevity of expression, clarity of purpose, directness of focus and effectiveness of the report). Language and organisation of reports. Technical report writing skills (steps, problems in writing, distinguishing technical and other reports, significance, format and styles of writing technical reports). Different formats for communication; styles of correspondences – business report and proposal, business letter, memorandum, e-mails, etc.

Proposals for projects and research; format, major steps and tips of grant-oriented proposals. Research reports (competency, major steps, components and formats of research reports and publishable communication). Sources and handling of data, tables, figures, equations and references in a report. Presentation skills; overview, tips, organisation, use of visual aids and practising of presentation. Intellectual property rights in research reports. Case studies of major engineering designs, proposals and industrial failures with professional presentation of reports.

GET 305: 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. work with data from the point of view of knowledge convergence, machine learning, and intelligence augmentation, which significantly raises their standard for engineering analysis (the approach forces them to learn statistics in an actionable way that helps them to see the holistic importance of data analytics in modern engineering and technology);
2. anticipate the future with Artificial Intelligence while fulfilling the basic requirements of conventional engineering statistical programming consistent with their future careers;
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. plan and execute experimental programmes to determine the performance of programme-relevant industrial engineering systems, and evaluate the accuracy of the measurements undertaken; and
5. demonstrate mastery of data analytics and statistical concepts by communicating the results of experimental and industry-case investigations, critically reasoned scientific and professional analysis through written and oral presentation.

Course Contents

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.

GET 306: Renewable Energy Systems and Technology (3 units C: LH 30; PH 45)

Learning Outcomes

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

1. identify the types, uses and advantages of renewable energy in relation to climate change;
2. design for use the various renewable energy systems;
3. recognise and analyse the current energy systems in Nigeria, their impacts on development and the global energy demand and supply scenarios;
4. appreciate the environmental impact of energy exploitation and utilisation, and pursue the sustainable development of renewable energy for various applications; and
5. recognise the exploitation, excavation, production, and processing of fossil fuels such as coal, petroleum and natural gas, and discuss the sources, technology and contribution to future energy demands of renewable energy.

Course Contents
Current and potential future energy systems in Nigeria and globally - resources, extraction, concepts in energy conversion systems; parallels and differences in various conversion systems and end-use technologies, with emphasis on meeting 21st-century national, regional and global energy needs in a sustainable manner. Various energy technologies in each fuel cycle stage for fossil (oil, gas, synthetic), nuclear (fission and fusion) and renewable (solar, biomass, wind, hydro, and geothermal). Energy types, storage, transmission and conservation. Analysis of energy mixes within an engineering, economic and social context. Sustainable energy; emphasise sustainability in general and in the overall concept of sustainable development and the link this has with sustainable energy as the fundamental benefit of renewable energy

Practical Contents
Simple measurement of solar radiation, bomb calorimeter determination of calorific value of fuels and biomass; measurement of the velocity of wind, waves and the energy that abound in them; laboratory production of biogas and determination of energy available in it; simple conversion of solar energy to electricity; transesterification of edible oil into biodiesel; simulation of geothermal energy; Geiger-Muller or Scintillation Counters' determination of uranium or thorium energy; simple solid or salt storage of energy; hybrid application of renewable energy.

CPE 301: Computer Organisation and Architecture (3 Units C: LH 45)

Learning Outcomes
Upon completion of this course, the students will be able to:
1. describe the fundamental organisation of a computer system;
2. explain the functional units of a processor;
3. explain addressing modes, instruction formats and programme control statements;
4. identify the organisation of various parts of a system memory hierarchy;
5. describe basic concept of parallel computing; and
6. describe fundamentals concepts of pipeline and vector processing.

Course Contents
Computer fundamentals: development history of computer hardware and software; hard-wired vs stored program concept; Von-Neuman architecture; Harvard architecture: principle of operation, advantages and disadvantages; single address machine; contemporary computers; computer system: block diagram, functions, examples, dataflow and 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 and 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 organisation and error correction, cache memory, and memory storage devices; overview of I/O, programmed and interrupt-driven I/Os, DMA, I/O channel and I/O processor; control unit: micro-operations, control of the CPU, hard-wired implementation, control unit operation, micro-instruction sequencing and execution, and micro-programmed control; using 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 organisation, and instruction pipelining; high performance computer systems: techniques to achieve high performance, pipelining, storage hierarchy, and units with function dedicated for I/O; RISC, introduction to superscalar processor, and parallel processor; using popular RISC processor

(e.g. i960, Motorola PowerPC) as case study. Operating system: overview of operating system, dimension and type of 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).

CPE 302: Measurement and Instrumentation (3 Units E: LH 30; PH 45)

Learning Outcome

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

1. analyse the performance characteristics of each instrument;
2. analyse basic metres such as voltmeters and ammeters;
3. explain different types of signal analysers;
4. explain 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 Contents

Transducers and applications; general instrumentation, basic meters in DC measurement, basic meters in AC measurements, rectifier, voltmeter, electro-dynamometer, and wattmeter, instrument transformers, DC and AC bridges and their applications general form of AC bridge, universal impedance bridge, electronic instruments for the measurement of voltage current resistance and other circuit parameters, electronic voltmeters, AC voltmeters using rectifiers, electronic multi meter, digital voltmeters; oscilloscope, vertical deflection system horizontal deflection system, probes, sampling CRO; and electronic function. generators.

CPE 307: Assembly Language Programming (2 Units C: LH 45)

Learning Outcomes

Upon successful completion of this course, the student will be able to:

(Knowledge Based)

1. understand basic assembly language syntax;
2. identify and use different 8086 addressing modes;
3. create and use a stack to store data, addresses, or both; and
4. highlight and know the uses of the different 8086 instruction groups.

(Skills)

1. development of general programming skills; and
2. be able to run assembly language code.

Course Contents

Introduction: Language level of abstraction and effect on machine, characteristics of machine code, advantages, justifications of machine code programming, instruction set and dependency on underlying processor; Intel 8086 microprocessor assembly language programming: programming model as resources available to programmer, addressing modes, instruction format, instruction set- arithmetic, logical, string, branching, programme control, machine control, and input/output, etc; assembler directives, hand-assembling, additional 80x86/Pentium instructions; modular programming; interrupt and service routine; interfacing of assembly language to C; Intel 80x87 floating point programming; introduction to MMX and SSE programming; Motorola 680x0 assembly language programming; extensive

practical engineering problems solving in assembly language using MASM for Intel, and cross-assembler for Motorola.

EEE 321: Analogue Electronic Circuits (3 Units E: LH 30; PH 45)

Learning Outcomes
At the end of the study, the student should be able to:
1. understand the basics of semiconductor devices and their applications in different areas;
2. understand different biasing techniques to operate transistor, FET, MOSFET and operational amplifier in different modes; and
3. analyse output in different operating modes of different semiconductor devices.

Course Contents
Single-stage transistor amplifiers using BJT and FET Equivalent circuits and calculation of current gain, voltage gain, power gain, input and output impedance. Operational Amplifiers: Description, parameters and applications. Feedback, broadband and narrowband amplifiers. Power amplifiers. Voltage and current stabilizing circuits. Voltage amplifiers, multi storage amplifiers using BJTs and FETs.

EEE 322: Digital Electronic Circuits (2 Units E: LH 30)

Learning Outcomes:
Students will be able to:
1. classify, describe and discuss the various logic gates and flip-flops and multivibrators; and
2. design simple logic and sequential circuits using logic gates and flip-flops.

Course contents
Number Systems and Codes. Logic Gate Simplification of Logic expressions using Boolean algebra. Simplification of Logic expressions using Karnaugh Method. Design of combinational circuit. Flip-Flops. Application of Flip-Flops in the design of counter. Registers and timers. Switching and wave shaping circuits. Generation of non-sinusoidal signal (multivibrators). Introduction to ADC and DAC. Design of Logic Gates (Diode, DTL, TTL, ECL etc). Sequential circuits. Introduction to microprocessors.

GET 399: Students Industrial Work Experience II (4 Units C: 12 weeks)

Learning Outcomes
At the end of the SIWES, students should be able to:
1. demonstrate proficiency in at least any three softwares in their chosen career choices;
2. demonstrate proficiency in some animation videos (some of which are free on YouTube) in their chosen careers;
3. carry out outdoor hands-on construction activities to sharpen their skills in their chosen careers;
4. demonstrate proficiency in generating data from laboratory analysis and develop empirical models;
5. demonstrate proficiency in how to write engineering reports from lab work;
6. fill logbooks of all experience gained in their chosen careers; and
7. write a general report at the end of the training.

The experience is to be graded and the students must pass all the modules of the attachment and shall form part of CGPA.

Course Contents
On-the-job experience in industry chosen for practical working experience but not necessarily limited to the student's major (Students are to proceed on three months of work experience i.e., 12 weeks during the long vacation following 300 level). Students are engaged in the more advanced workshops, indoor software design training similar to what they will use in the industry and outdoor construction activities to sharpen their skills. The use of relevant animation videos that mimic industrial scenarios is encouraged. Students are to write a report at the end of the training. As much as possible, students should be assisted and encouraged to secure 3 months placement in the industry. Examples of outline of activities and experiences to which students are expected to be exposed to earn prescribed credits include:

Section A: Welding and fabrication processes, automobile repairs, · lathe machine operations: machining and turning of simple machine elements, such as screw threads, bolts, gears, etc. Simple milling machine operations, machine tool maintenance and trouble- shooting, and wooden furniture making processes.

Section B: Mechanical design with computer graphics and CAD modelling and drafting. Introduction to Solidworks: software capabilities, design methodologies and applications. Basic part modelling: sketching with SolidWorks, building 3D components, using extruded Bose base · Basic assembly modelling, and solidWorks drawing drafting. Top-down assembly technique exploded view, exploded line sketch. Introduction to PDMS 3D design software; autoCAD mechanical, SPSS.

A comprehensive case study design project. The student should be introduced to the concept of product/component design and innovation and then be given a comprehensive design project.

Examples of projects should include the following:
a. design of machine components;
b. product design and innovation;
c. part modelling and drafting in solidworks; and d.
technical report writing.

EDSU-CPE 319: Computer Engineering Laboratory and Design I (1 Unit C: PH 45)

Senate Approved Relevance
The Computer Engineering Laboratory course is designed and intended to teach students hands-on and give students practical experience in various aspects of Computer Engineering. This course will produce graduates that can develop and apply new techniques to solve complex industry and business problems using different programming languages and are capable of deploying various Computer hardware to achieve organizational goals. This is in line with the vision of EDSU to become a pioneer in Outcome Based Education (OBE) and to produce graduates that are exposed to state-of-the-art Computer hardware, software, networking, and various programming languages.

Course Overview
The Computer Engineering Laboratory course is designed to expose students to hands-on practical experience in various aspects of Computer Engineering including hardware, software tool, and programming languages to enhance Outcome Based Education. It introduces and engenders Computer Engineering core discipline.

The course teaches students how to develop techniques to solve complex industry and business problems using different programming languages and deploying various hardware.

Course Objectives

The objectives of the course are to:

1. demonstrate computer engineering-based application with respect to hardware and software systems
2. configure computer Network for knowledge base integration
3. write codes in MATLAB, C++, and C#
4. assemble networks of LAN using CISCO packet Tracer
5. configure Switches and Routers by interconnecting them with devices.

Learning Outcome

At the end of this course, students are expected to be able to

1. explain computer engineering-based applications with respect to hardware and software systems
2. modify and reconfigure computer Network for knowledge base integration
3. implement codes in MATLAB, C++ and C#
4. implement network of a LAN using CISCO packet Tracer
5. organise Switch and Router interconnect with devices and then simulate

Course Contents

Network design. Network installation. Network access. Structured cabling. Network management. Switches configuration. Router configuration. Troubleshooting Network devices. Connectivity testing. IP Connectivity. IP Services. Security Fundamentals. Networking tools. Application of packet tracer. Configuration and implementation of networks using CISCO Tracer. MATLAB and PSPICE. Implementing basic C++, C# and .Net codes to solve related problems.

EDSU-CPE 329: Computer Engineering Laboratory and Design II (1 Units E: PH 45)

Senate Approved Relevance

The Computer Engineering Laboratory course is designed and intended to teach students hands-on and give students practical experience in various aspects of Computer Engineering. This course will produce graduates that can develop and apply new techniques to solve complex industry and business problems using different programming languages and are capable of deploying various Computer hardware to achieve organizational goals. This is in line with the vision of EDSU to become a pioneer in Outcome Based Education (OBE) and to produce graduates that are exposed to state-of-the-art Computer hardware, software, networking, and various programming languages.

Course Overview

This Computer Engineering Laboratory course is a continuation of Computer Engineering Laboratory and Design I. It is designed to build on the professional competence and hands-on practical experience of Computer Engineering students in various aspects of Computer Engineering including hardware, software tool, and programming languages to enhance Outcome Based Education. It introduces and engenders Computer Engineering core discipline.
The course teaches students how develop techniques to solve complex industry and business problems using different programming languages and deploying various hardware.

Course Objectives

Computer Engineering Laboratory II is designed to:

1. assemble and demonstrate computer engineering-based applications with respect to software systems
2. illustrate codes to predict, perform and solve computational problems
3. test software models in resolving real-life scenarios
4. implement circuit designs using transistors and MOSFET components
5. implement circuit designs using sensors or transducers

Learning Outcome

At the end of this course, students are expected to be able to

1. explain computer engineering-based applications with respect to software systems
2. demonstrate codes to predict, perform and solve computational problems
3. implement software models in resolving real-life scenarios
4. conduct practical circuit designs using transistors and MOSFET components
5. conduct practical circuit designs using sensors or transducers

Course Contents

Applied computer programming. Programming skills. Basis of C++ & Concept. INPUT-OUTPUT displays. Using loops to implement and solve problems. Implementing codes to predict. Perform and solve computational problems. Compiling and debugging mechanism. Practical implementation of software engineering. Role of software. Software crises. Development models. Requirements of design, testing and evaluation. Transistor. MOSFET characteristics. Sensors and transducers. Circuit design using sensors. Mini project.

EDSU-CPE 311: Computer Networks and Communications (2 Units C: LH 15; PH 45)

Senate Approved Relevance

Producing highly skilled graduates that have the knowledge of developing systems that are capable of revolutionizing communications and e-commerce across various interconnected computer networks around the world is in agreement with EDSU's mission. Thus, this course is designed to teach students how to deploy Computer networks that enable communication for every business, entertainment, and for research purposes. The internet, online search, electronic mail (email), audio and video transmission, e-businesses, live-streaming, social media, and collaborative work at different locations all exist because of computer networks and communication.

Overview

This course provides a comprehensive overview of the fundamentals of networking that focuses on an analytical approach to network design, dimensioning, and controls. Description: Fundamental understanding of basic network design, routing, dimensioning, and control; here we will study various network functions such as error-recovery algorithms, flow control, congestion control, routing, multi-access, switching, etc.

This course also deals extensively with the structure and components of computer networks, packet switching, and layer architectures as well as a variety of applications. Gain the experience and tools required to use and write protocols. Explore issues of network security.

Course Objectives

Data Communication and Networks is designed to:

1. discuss basic switching techniques for various network topology

2. discuss LAN using different protocols for performance comparison
3. describe the various OSI model and establish their unique features
4. discuss the performance of TCP/IP protocol suite
5. create nodes to communicate using socket programming at part IP addressing
6. identifying the number of network hardware connected to a network

Learning Outcome

At the end of this course, students are expected to be able to

1. explain the basic switching techniques for various network topology
2. explain using different protocols for performance comparison
3. distinguish the various OSI model and establish their unique features
4. state the performance of TCP/IP protocol suite
5. implement socket programming on a particular port at part IP addressing
6. implement the number of network hardware connected to a network

Course Contents

Fundamentals of Network Communication. Communication Networks and Services. Layered Architectures. Socket API and Digital Transmissions. Error Control. Switching techniques. Network Classification. Network typologies. Transmission media implementation. ISO/OSI Reference Models. Interfacing and inter-networking. Network security. Network operating systems and applications. Internet Protocol. Voice-over-IP. IP Addressing. Transmission Control Protocol. Socket programming.

EDSU-CPE 323: Operating System and Concept (2 Units C: LH 30)

Senate Approved Relevance

In line with EDSU's mission to develop highly skilled Computer Engineers with vast knowledge in developing Operating systems (OS), this course is designed to teach EDSU Computer Engineering students to develop programs that manage computer and software resources, especially the allocation of resources among other programs for next generation Computer Systems. The course teaches students the design and development of the operating system and the main goals of an operating system which are convenience, efficiency, and capability of evolution. The capability of evolution, in building an operating system is possible to make it easier to develop, test, and use new systems.

Overview

This course teaches the basics of operating system abstractions, mechanisms, and their implementations. The core of the course contains concurrent programming (threads and synchronization), inter-process communication, and an introduction to distributed operating systems.

The course is split into Five (5) sections: Introduction, Process and Thread Management, Resource Management and Communication, File and device management, and Distributed process.

Course Objectives

Operating System and Concept is designed to:

1. state key roles of the operating system in the functional operation of the computer system
2. discuss API concept with Operating system for the computer system
3. discuss design principles in Operation System and distinguish their peculiar

characteristics
4. describe the operational pattern of memory management in the structure of OS
5. discuss security methods deployable in an OS platform
6. describe models of protection and memory protection mechanism.

Learning Outcome

At the end of this course, students are expected to be able to

1. explain key roles of the operating system in the functional operation of the computer system
2. demonstrate API concept with Operating system for computer system
3. state design principles in Operation System and distinguish their peculiar characteristics
4. explain the operational pattern of memory management in the structure of OS
5. enumerate the security methods deployable in an OS platform
6. state models of protection and memory protection mechanism

Course Contents

History and overview of operating systems. Operating system architecture. The history and experience of systems programming. Design principles. Concurrency. Process scheduling and dispatch. File systems. Device management. Security. Networking and distributed processing. Process migration. Process and Process Management. Concept of Threads. Scheduling. Inter-Process Communication. Concurrent execution. Device Management. Memory management using virtual memory and memory allocations. Scalability. Virtualization.

EDSU-CPE 312: Data Structure, Object-Oriented Programming & Algorithm Development (2 Units C: LH 30)

Senate Approved Relevance

In line with the EDSU vision to become a center of excellence in quality teaching, research, innovation, and community development, this course is designed to teach students the required skills for various applications, software development, and cutting-edge research into artificial intelligence which is the trend in modern technology development. This course aims to train students to understand and implement programming paradigm which is based on the concept of "objects", which can contain data and code. This enables students to have access to the creative, fast-paced world that relies on machine connections. Students can apply these skills to various industries and disciplines such as 3D animation, web design, application development, Machine learning, and artificial intelligence.

Overview

A good algorithm usually comes together with a set of good data structures that allow the algorithm to manipulate the data efficiently. In this course, we consider the common data structures that are used in various computational problems. How these data structures are implemented in different programming languages and will practice implementing them in our programming assignments. This will help to understand what is going on inside a particular built-in implementation of a data structure and what to expect from it. Typical use cases for these data structures will be implemented. Also, to understand the basic principles of object-oriented design principles, including classifying different objects, parent classes and child classes, class hierarchies, and OOP languages like javascript.

In Algorithm development, we will learn several fundamental principles of algorithm design. Such as the divide-and-conquer design paradigm, with applications to fast sorting, searching, and multiplication.

Course Objectives

Object-Oriented Programming Design & Development is designed to:

1. discuss the different data types and their uses
2. describe different data structures
3. discuss networks using learned methods.
4. analyse various data algorithm
5. describe procedural abstraction
6. illustrate data structure algorithms using Java, Python, and C++
7. discuss Object-Oriented Programming Patterns and basic concepts
8. discuss object-oriented programming in Java or C++ using large sunset of the language effectively
9. discuss programming tools such as an integrated development environment (IDE) debugger and code repository.
10. discuss graphical user interfaces suitable for scaling on multiple devices and resolutions
11. identify, document, and implement software for real-world client applications.
12. identify with team members to develop software applications

Learning Outcome

At the end of this course, students are expected to be able to

1. explain the different data types and their uses
2. explain different data structures
3. demonstrate networks using learned methods.
4. identify various data algorithm
5. explain the use of procedural abstraction
6. conduct practical data structure algorithms using Java, Python and C++
7. explain Object-Oriented Programming Patterns and basic concepts
8. demonstrate object-oriented programming in Java or C++ using large sunset of the language effectively
9. explain programming tools such as an integrated development environment (IDE) debugger and code repository.
10. demonstrate graphical user interfaces suitable for scaling on multiple devices and resolutions
11. identify, document, and implement software for real-world client applications.
12. conduct practicals with team members to develop software applications

Course Contents

Introduction and overview. Mathematical Preliminaries. Introduction to Data Structures. Introduction to Object-Oriented Programming. Object-Oriented Programming Pattern. Introduction to Algorithm Development. Algorithm Design Paradigms. Approximation Algorithms. Arrays, Iteration, and Inviriants. Lists, Recursion, stacks, and Queues. Searching. Efficiency and Complexity. Trees. Binary Search Trees. Priority Queues and Heap Trees. Sorting. Hash Tables. Graphs. Software design in UML.

EDSU-CPE 324: Distributed Systems (2 Units C: LH 30)

Senate Approved Relevance

Developing professionally and technically sound computer engineers with competence in the designing of customised and optimized scalable computer systems for governments and industries is in agreement with EDSU's mission towards the promotion of high-quality manpower

for economic development in Edo State, Nigeria, and globally. This is also relevant to the objectives of the SDG goals 4 and 9.

Overview

Distributed systems are central to modern computing, from web applications to e-commerce to content distribution. This senior-level course will cover abstractions and implementation techniques for building distributed systems, including client-server computing, the web, cloud computing, peer-to-peer systems, and distributed storage systems. Topics will include remote procedure call, preventing and finding errors in distributed programs, maintaining consistency of distributed state, fault tolerance, high availability, and scaling.
This course focuses on algorithms and techniques for developing parallel and distributed applications and their architectures and systems. Parallel computing on a single computer uses multiple processors to process tasks in parallel, whereas distributed parallel computing uses multiple computing devices to process those tasks. In this course, students will explore distributed consensus, the CAP theorem, logical time, multicast, mutex, garbage collection, snapshots, deadlock detection, web caching, resource looking up in the P2P system, blockchain, multiprocessor scheduling, and multiprocessor caching.

Course Objectives

The objectives of this course are to:

1. explain the fundamentals of parallel and distributed computing architectures and paradigms.
2. discuss the technologies, system architecture, and communication architecture that propelled the growth of parallel and distributed computing systems.
3. discuss single-computer and multi-processor systems
4. describe and discuss the problems and algorithms for reaching consensus in distributed systems and its applications.
5. discuss load balancing and mechanics of load

Course Outcomes

By the end of this course, students will be able to:

1. state the fundamentals of parallel and distributed computing architectures and paradigms.
2. describe the technologies, system architecture, and communication architecture that propelled the growth of parallel and distributed computing systems.
3. distinguish between single-computer and multi-processor systems
4. describe and discuss the problems and algorithms for reaching consensus in distributed systems and its applications.
5. differentiate between load balancing and mechanics of load

Course Contents

Introduction to Parallel systems. Design considerations of parallel systems. Introduction to Cloud computing. Introduction to distributed systems. Grid computing. Cluster computing. Supercomputing. Multi-core computing. Internet of things. Asynchronous/synchronous computation. Concurrency control. Fault tolerance. GPU architecture and programming. Heterogeneity. Interconnection topologies. Load balancing. Memory consistency model. Memory hierarchies. Message passing interface (MPI). MIMD/SIMD. Multithreaded programming. Parallel algorithms & architectures. Parallel I/O. Performance analysis and tuning. Power. Programming models (data parallel, task parallel, process-centric, shared/ distributed memory). Scalability and performance studies. Scheduling. Storage systems. Synchronization.

EDSU-CPE 315: Electric Circuit Design and Applications (2 Units E: LH 30)

Senate Approved Relevance

Developing professionally and technically sound computer engineers with the competence in the designing of customised and optimized scalable computer systems for governments and industries, is in agreement with EDSU's mission towards the promotion of high quality manpower for economic development in Edo State, Nigeria and globally. This is also relevant to the objectives of the SDG goals 4 and 9.

Overview

The design and development of electric circuits is an important component required in the training of competent computer engineers. Experience in this course enables the engineer to apply the knowledge of circuits in a specific area of problem-solving, such as the development of circuits meant for a particular task. Design skills and the ability to solve complex engineering problems accruing from the knowledge of applied mathematics in this course will better equip the engineer in handling complex real-world problems.

In this course, we will learn everything about electric circuits and electronics, from the basics such as what an electric circuit is and the fundamentals of electrical quantities like voltage, current, and power, all the way to complex techniques for analyzing electric and electronic circuits.

Course Objectives

The objectives of this course are to:

1. discuss the fundamentals of electronics within the field of electrical engineering
2. describe the application of semiconductor in circuit design
3. review topics in BJT and FET transistor circuits and models
4. describe the small-signal analysis for transistor circuits
5. describe and analyse the applications of operational amplifiers in circuits
6. conduct practicals on the skill of circuit designs
7. discuss the mathematical relationships in circuit design
8. conduct practical on circuit simulation skills using computer software applications
9. apply Kirchhoff's current and voltage laws and Ohm's law to circuit problems
10. describe circuits using series and parallel equivalents and using Thevenin and Norton equivalents
11. perform node and loop analyses and set these up in standard matrix format

Learning Outcomes

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

1. explain the fundamentals of electronics within the field of electrical engineering
2. describe the application of semiconductor in circuit design
3. enumerate topics in BJT and FET transistor circuits and models
4. explain the small-signal analysis for transistor circuits
5. demonstrate and analyse the applications of operational amplifiers in circuits
6. conduct practicals on the skill of circuit designs
7. explain the mathematical relationships in circuit design
8. explain circuit simulation skills using computer software applications
9. implement Kirchhoff's current and voltage laws and Ohm's law to circuit problems
10. explain circuits using series and parallel equivalents and using Thevenin and Norton equivalents

11. implement node and loop analyses and set these up in standard matrix format

Course Contents

Overview of Systems of Units and basic circuit elements. Ohm's Laws. Nodes, Branches and Loops. Kirchhoff's Laws. Series Resistors and Voltage Division. Parallel Resistors and Current Division. Wye-Delta Transformations. Methods of Analysis. Nodal Analysis. Nodal Analysis with Voltage Sources. Mesh Analysis. Mesh Analysis with Current Sources. Nodal and Mesh Analyses by Inspection. Nodal Versus Mesh Analysis. Circuit Theorems. Linearity Property. Superposition. Source Transformation. Thevenin's Theorem. Norton's Theorem. Derivations of Thevenin's and Norton's Theorems. Maximum Power Transfer. Operational Amplifiers. Operational Amplifiers. Ideal Op Amp. Inverting Amplifier. Noninverting Amplifier. Summing Amplifier. Difference Amplifier. Cascaded Op Amp Circuits. Op Amp Circuit Analysis. Capacitors and Inductors. Series and Parallel Capacitors. Inductors. Series and Parallel Inductors. First Order Circuits. The Source-free RC Circuit. The Source-free RL Circuit. Singularity Functions. Step Response of an RC Circuit. Step Response of an RL Circuit. First-order Op Amp Circuits. Second Order Circuits. Finding Initial and Final Values. The Source-Free Series RLC Circuit. The Source-Free Parallel RLC Circuit. Step Response of a Series RLC Circuit. Step Response of a Parallel Circuit. General Second-Order Circuits. Second-Order Op Amp Circuits. Sinusoidal steady-state analysis. AC circuit power analysis. Polyphase circuits. Magnetically coupled circuits. Complex frequency and Laplace transform. Circuit analysis and the s-Domain. Frequency response. Bode Diagram. Fourier circuit analysis. Computer Applications.

EDSU-ENT 321: Entrepreneurial Skills (1 Unit C: LH 0; PH 30)

Senate-approved relevance

The training of high-quality graduates who are equipped with the knowledge of channeling their creativity into creating productive and innovative things that can contribute significantly to the current competitive world at large and particularly Nigeria is of immense relevance to Edo State University. This is important as it will lead to the production of graduates with innovative, analytical, and logical reasoning.

Learning objectives

The learning objectives of this course are to:

1. Define the concepts and the profitability of entrepreneurial skills.
2. Develop high entrepreneurial potential in students.
3. Describe the key requirements for entrepreneurial skills
4. Analyze the various possible business ideas open to students.
5. Engage in practical activities on various entrepreneurial skills

Learning Outcomes:

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

1. Explain at least two concepts and profitability of entrepreneurial skills.
2. Apply entrepreneurial potential in setting up a business.
3. Outline five key requirements for the entrepreneurial skills
4. Explain one possible business idea.
5. Showcase the product from the practical activities and their various entrepreneurial skills for exhibition

Course Contents

Soap/Detergent, Toothbrush, and Toothpaste making; Photography; Brick making; Rope making; Brewing; Glassware production/ Ceramic production, Paper production; Water

treatment/conditioning/packaging; Food processing/preservation/packaging; Metal fabrication; Tanning industry; Vegetable oil extraction; Farming; Fisheries/aquaculture; Plastic making; Refrigeration/Air-conditioning; Carving, Weaving; Bakery; Tailoring; Printing; Carpentry; Interior Decoration; Animal husbandry, etc. Case Study Methodology applied to the development and administration of Cases that bring out key issues of the business environment, start-up, pains and gains of growth of businesses, etc. with particular reference to Nigerian businesses. Experience sharing by business actors in the economy with students during Case presentations.

400 Level

CPE 401: Microprocessor and Embedded Systems (3 Units C: LH 45

Learning Outcomes

Upon the successful completion of the course, students will be able to:

1. develop an ALP in 8085 microprocessor using the internal organisation for the given specification;
2. describe the architecture and functional block of 8051 microcontroller;
3. develop an embedded C and ALP in 8051 microcontroller 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 Contents

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; and discussion of a typical system e.g. IBM PC, Apple Macintosh.

CPE 403: Control Systems (2 Units C: LH 30)

Learning Outcomes

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

1. state examples of simple control systems;
2. state and explain different stability criteria and compensation methods for linear control systems; and
3. discuss non-linear control systems and their characteristics.

Course Contents

Basic concepts and examples of control systems; Feedback, Time response analysis, concept of stability, Routh-Hurwitz criterion; Root-locus techniques, Frequency-response analysis, Polar and Bode plots, Nyquist stability criteria. Nichol's chart, compensation techniques; introduction to non-linear systems.

CPE 405: Fundamentals of Software Engineering (2 Units C: LH 30)

Learning Outcomes

Upon successful completion of this course, the student should be able to:

1. identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements;
2. elicit, analyse and specify software requirements through a productive working relationship with various stakeholders of a software development project;
3. function effectively as a team member
4. understand professional, ethical and social responsibility of a software engineer;
5. participate in design, development, deployment and maintenance of a medium scale software development project;
6. convey technical material through oral presentation to, and interaction with, an audience;
7. convey technical material through written reports which satisfy accepted standards for writing style;
8. use Unified Modeling Language in software specification documents; and
9. evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of contemporary issues and merging software engineering trends, models, tools, and techniques.

Course Contents

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 and implementation.

CPE 411: Hardware Design Techniques and Verification (2 Units E: LH 30)

Learning Outcomes

Upon successful completion of this course, students will be able to demonstrate

1. adequate knowledge in digital electronics and digital design concepts;
2. ability to design and implement digital circuits under realistic constraints and conditions;
3. ability to debug, verify, simulate digital circuits;
4. ability to devise, select, and use modern techniques and tools needed for digital design; and
5. ability to work in a team.

Course Contents

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

CPE 413: Research Methods (2 Units E: LH 30)

Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Describe and explain key research concepts, issues, types of research and the systematic process of research gap identification and documentation and use contexts;
2. Search for, assembling and critically analysing research articles, papers and reports and general literature;
3. Formulate and evaluate research objectives, questions and hypotheses;
4. Developing a research proposal or industry project plan;
5. Identify and develop appropriate data acquisition and analysis methods and instrument;
6. Design/structure and lead the research process using appropriate research designs;
7. Use appropriate tools/techniques, including computer soft- and hardware /technologies to interpret, discuss and report/present the result and conclusions derived from research data analysis in oral or written form; and
8. Prepare/format/package research results/output for academic, journal articles, technical and other reports and exhibitions/fairs (scientific, trade, etc.) as an individual or team/work group.

Course Contents

Origins and definitions of research; problem identification and formulation; research types/design; qualitative, quantitative and mixed methods of research; measurement; sampling; data analysis; interpretation of data and technical report writing; use of encyclopedia, research guides, handbooks, academic databases for computing and computer engineering discipline; use of tools/techniques for research production: referencing formats/styles and software; research management and reporting best practices; plagiarism-definitions, types, detection software; basics of document analysis, systematic review and management methods; practical documentation/presentation projects/seminars.

GET 499: Students Industrial Work Experience III (8 Units C: 24 weeks)

Learning Outcomes

Students on Industrial Work Experience Scheme (SIWES) are expected to:

1. be exposed and prepared for the Industrial work situation they are likely to meet after graduation, by developing their occupational competencies;
2. bridge the existing gap between theory and practice of programmes through exposure to real-life situations, including machines and equipment handling, professional work methods and ethics, human relations, key performance assessment methods, and ways of safeguarding the work environment – human and materials;
3. experience/simulate the transition phase of students from school to the world of work and the environment seamlessly,and expose them to contacts for eventual job placements after graduation;
4. be motivated to identify the industrial and practice engineering challenges of their place of engagement and the larger society and creatively device impactful solutions to them; and
5. exploit the opportunity to improve and utilise their acquired critical thinking and innate creativity skills, during the program and SIWES Seminar presentation respectively.

Course Contents

On-the-job experience in industry chosen for practical working experience but not necessarily limited to the student's major (24 weeks from the end of the first semester at 400-Level to the beginning of the first semester of the following session. Thus, the second

semester at 400-Level is spent in industry). Each student is expected to work in a programme related industry, research institute or regulatory agencies etc, for a period of 6 months under the guidance of an appropriate personnel in the establishment but supervised by an academic staff of the Department. On completion of the training, the student submits the completed Log book on the experience at the establishment., Also, there will be a comprehensive report covering the whole of the student's industrial training experiences (GET 299, GET 399 and GET 499), on which a seminar will be presented to the Department for overall assessment.

EDSU-CPE 419: Computer Engineering Laboratory & Design III (2 Units E: PH 45)

Senate Approved Relevance

Training of highly skilled computer engineers who are knowledgeable in the practical demonstration and design of prototypes of electronic and computer devices that is in agreement with EDSU's mission to address the challenges in producing highly skilled practically oriented Computer engineers from EDSU. And being able to assemble components relating to knowledge of very large-scale integrated circuits which is of immediate value to the industry. This course also purses the interests of the objectives of goals 1, 2, 4, and 9 of the SDG.

Overview

Prototyping is a critically important part of every stage in the development of a new product. Early, low-fidelity prototypes can help to refine basic ideas of how a product or system will work, helping to make changes and guide future development from very early in the development process. Early prototyping can save immensely on time and money later on. Medium-fidelity prototypes can be used to validate shape and form, to gather early design feedback, to test basic functionality, and to help make important design decisions toward finalizing a design. End-stage, high-fidelity prototypes can be used to do final functional testing, to get feedback from end-users, to help gather outside investments or crowdfunding Backers, and to help while working with manufacturers.

This course is designed to equip students with practical skills in computer engineering design, development, maintenance, testing debugging, troubleshooting, and manufacturing.

Course Objectives

The objectives of this course are to:

1. describe a digital circuit board with an oscilloscope
2. discuss information system projects
3. demonstrate system testing, feedback collection, and improvement of mass-produced product
4. illustrate system performance testing for a fully developed and integrated system.
5. describe the performance of system based on functional requirements specifications (FRS) and system requirements specifications (SRS).
6. classify system tests based on the design, behaviour, and usability aspects.

Learning Outcome

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

1. analyze a digital circuit board with an oscilloscope
2. explain information system projects
3. explain system testing, feedback collection, and improvement of mass-produced product
4. analyse system performance testing for a fully developed and integrated system.

5. explain the performance of system using functional requirements specifications (FRS) and system requirements specifications (SRS)
6. differentiate between system tests based on the design, behaviour, and usability aspects.

Course Content
Introduction to Prototyping Techniques. Types of prototyping techniques. Grounding. Digital ground. Analogue ground. Decoupling. Soldering techniques for pass-through and surface mount components. Desoldering. Breadboarding. Vero boarding. Wire wrapping techniques. Radio Frequency design and implementation techniques. Printed Circuit Board techniques and production of PCB. Use of PCB CAD packages. Prototyping techniques. System Testing and Troubleshooting. Superficial operations of hardware and software. Testing LSI and VLSI devices. Conventional test equipment and limitations. System testing philosophy. Stress testing. Troubleshooting tree logic analysers. Signature analysers. Development systems and system testing. Emulators and simulators. Self-test and diagnostic software. Testing peripheral-related functions. Verification testing. Characterization testing and design debugging. Design and test procedure. Manufacturing testing. Chip Factory testing. Parametric faults and Random defects test. Acceptance testing (incoming inspection). The customer performs tests.

EDSU-CPE 416: Business Information and Intelligence (2 Units C: LH 30)

Senate Approved Relevance
The mission of EDSU addresses concerns in the development of high-level manpower in technical fields for economic and industrial growth in Edo State and Nigeria at large. Computer engineers are trained to possess business analytics skills that can increase business information's potential and realized value chain for industries or governments. This course in pursuant of this mission would also achieve the objectives of SDG goals 4 and 9.

Overview
Thriving in the Information age compels organizations to deploy information as an actual business asset, not as an IT asset or merely as a business by-product. This demands creativity in conceiving and implementing new ways to generate economic benefits from the wide array of information assets available to an organization. Unfortunately, information too frequently is underappreciated and therefore underutilized.

This course provides a non-technical perspective on and methods for understanding and taking advantage of information's unique benefits. Starting with dissecting whether the information is or isn't an asset or even property, students will begin to appreciate the challenges and opportunities while treating it as one. Then the course examines how information behaves in the context of various familiar business concepts, and what can be gleaned from this to improve the way information is managed and leveraged. This leads to exploring the various ways information can generate business benefits—or be monetized, including how various styles of business analytics can increase information's potential and realized value for organizations.

Course Objectives
The objectives of this course are to:

1. discuss the fundamental principles of information system
2. discuss the components of the decision-making process
3. illustrate the effect of a mathematical model in the decision-making process
4. develop an understanding of business intelligence
5. discuss the basis of data mining

6. Identify and adapt data analytics to business principles and practices toward the improved management of information assets.
7. discuss the unique economic and business characteristics of information.
8. demonstrate a practical application of business intelligence

Learning Outcome

At the end of this course, students are expected to be able to

1. explain the fundamental principles of information system
2. outline the components of a decision-making process
3. explain the effect of a mathematical model in the decision-making process
4. express an understanding of business intelligence
5. explain the basis of data mining
6. apply data analytics to business principles and practices toward the improved management of information assets.
7. identify the unique economic and business characteristics of information.
8. explain the practical application of business intelligence

Course Contents

Business Information Systems in Practice. Information value. Classification of sources of value and types of processing. Nature and role of business intelligence. Jobs and Roles of Data Engineers and Financial Engineering. Components of the decision-making process. Business intelligence. Effective and timely decisions. Data, information and knowledge. Role of mathematical models. Business intelligence architectures. Ethics and business intelligence. Definition of system. Decision support systems. Representation of the decision-making process. Rationality and problem-solving. Evolution of information systems. Data warehousing (Data marts and Data quality). Mathematical models for decision making. Development and classes of models. Introduction of Data mining. Models and methods for data mining and application. Analysis methodologies. Data preparation and exploration. Univariate, Bivariate and Multivariate. Regression. Time series analysis. Classification. Association rules. Clustering. Business intelligence applications. Marketing models. Relational marketing. Salesforce management. Business case studies. Automotive industry acquisition. Logistic and production models - Supply chain. Revenue management systems. Business case studies. Data envelopment analysis. Use of data analysis tools - Power BI. Financial Engineering in Practical Business Applications.

EDSU-CPE 417: Communication Engineering Principles and Applications (2 Units C: LH 30)

Senate Approved Relevance

This course is in line with EDSU's mission of promoting quality learning leading to technical skill acquisition for the development of human capacity and economy Edo State and Nigeria in general, and also in pursuant of the achievement of the objectives of goal 4 and 9 of the SDG. Computer engineers are trained with the acquisition of communication engineering skills that are deployable in the design and implementation of communication systems and components for telecom operators and subsidiary organisations.

Overview

This course covers fundamental concepts of communication systems, which are essential for the understanding of advanced courses in digital/ wireless communication systems. It will also cover several important modulation techniques such as electromagnetic fields and waves, Amplitude Modulation, Frequency Modulation, Phase Modulation, etc. The sampling process and

Quantization, including the Nyquist criterion and reconstruction of the original signal from the sampled signal will be dealt with in the later parts of the course.

Furthermore, the course will also cover concepts of commercial radio systems. Transmission media; attenuation, time division multiplexing; Frequency division multiplexing; Synchronous and asynchronous transmission/communication. Plesio-synchronous digital hierarchy, Synchronous digital hierarchy, Multiplexing PDH signals into SDH STM-1 transport module. It will also deal with Wavelength division multiplexing (WDM): Dense wavelength division multiplexing (DWDM).

Course Objectives

The objectives of this course are to:

1. discuss wave propagation and wave theory
2. describe and analyse the components of a communication systems
3. discuss the purpose of modulation in a communication system
4. distinguish between Analogue and Digital Modulation in communication engineering.
5. discuss the principles of amplitude modulation, frequency modulation, and angle modulations, and be able to analyse their performance in relation to noise
6. describe the principles of various digital modulation systems and analyse their parameters such as bandwidth, channel capacity, transmission over band-limited channels, inter-symbol interference (ISI), demodulation methods, and error performance in the presence of noise
7. compare FDM and TDM and their application

Learning Outcomes

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

1. Explain wave propagation and wave theory
2. design and analyse communication systems
3. explain the purpose of modulation
4. differentiate between Analogue and Digital Modulation in communication engineering.
5. explain amplitude modulation, frequency modulation, and angle modulations
6. explain the principles of various digital modulation systems and their properties, including bandwidth, channel capacity, transmission over band-limited channels, inter-symbol interference (ISI), demodulation methods, and error performance in the presence of noise
7. explain and differentiate between FDM and TDM and their application

Course Content

Review of electromagnetic laws in integral form. Gauss's Law. Ampere's and Faraday's Laws. Electrostatic fields due to the 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 coordinates and vector-calculus notation). Derivation of Maxwell's equations. Electromagnetic potential and waves. Pointing vector. Wave propagation in good conductors. Skin effect. Plane waves in unbounded dielectric media. Fundamentals of transmission lines. Wave-guides. Antenna. Amplitude modulation. Angle modulation. Commercial radio systems. Transmission media. Attenuation in open space. Cable and fibre channels. Construction of cables and fibres. Sampling theorem. Pulse amplitude modulation. Pulse width modulation. Static and dynamic time division multiplexing. Frequency division multiplexing. Quantization systems and pulse code modulation. Delta modulation. Causes and correction of errors in PCM and DM. Synchronous and asynchronous transmission/communication. Synchronous digital hierarchy. Multiplexing PDH signals into SDH

STM-1 transport module. Wavelength division multiplexing (WDM). Dense wavelength division multiplexing (DWDM).

EDSU-CPE 418: Internet of Things Engineering and Cloud Computing (2 Units C: LH 30)

Senate Approved Relevance

This course was developed in line with the mission of EDSU for the advancement of skill-based knowledge for the economic development of Edo State, Nigeria, and beyond, which also promotes the achievement of the objectives of the SDG goal 4 and 9. Computer engineers are trained with the acquisition of cloud computing and Internet-of-Things skills that are deployable in wearable devices, sensor networks, e-health, m-health, block-chain, internet, web, and remote services for commercial, individual, and government organisations.

Overview

The Cloud computing is a network of remote services hosted on the internet to store, manage, and process data. Cloud provides massive storage capacity and processing power as against the limited capacities if the local systems. Internet of Things (IoT) on the other hand, is a network of physical objects embedded with sensors, computing hardware and software resources, processing ability and other technologies that enable them to share data with other devices over the internet or any other communication network. Cloud computing and IoT are both technologies for present and future development.

In this course, our students would be expected to come out with skills that will enable them deploy and manage cloud services for commercial, government, and individual-based on-demand. The course would also expose students to the skill needed for the development of IoT-based systems, such as smart homes, smart factories, and other smart systems. The integration of cloud and IoT technologies, such as edge, fog, and cloud-let would also form part of the expectation of this course.

Course Objectives

Specifically, the course is designed to:

1. discuss the fundamentals of Cloud Computing, its evolution, its applicability; benefits, as well as current and future challenges
2. describe the principles of data centre design; cloud management techniques and cloud software deployment considerations
3. discuss different types of CPU, memory, and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS)
4. discuss cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage
5. review a variety of programming models and develop working experience in several of them.
6. describe internet technologies applicable in IoT
7. discuss creative skill that extends the knowledge of the embedded system to the internet
8. describe the integration of sensors to embedded systems for monitoring and control actions
9. apply machine learning for IoT big data analytics
10. discuss edge, fog, and cloud technologies with embedded systems

Course Learning Outcome

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

1. explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing
2. illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS
3. analyze various cloud programming models and apply them to solve problems on the cloud
4. explain system, network, and storage virtualization and outline their role in enabling the cloud computing system model.
5. apply fundamental concepts in cloud infrastructures to trade-offs in power, efficiency and cost, and then explain how to leverage and manage single and multiple data centers to build and deploy cloud applications that are resilient, elastic, and cost-efficient
6. explain sensor based-embedded systems
7. demonstrate simple edge and fog devices using Arduino, NodeMCU, Raspberry Pi
8. develop Cloud architecture for integrating embedded sensor system
9. apply a simple machine learning algorithm for analysing real-time IoT data on the cloud

Course Contents

Historical overview of cloud computing. Basic Concepts of cloud computing and cloud models. Cloud providers and application of cloud computing. Cloud computing infrastructures. Data centres and evolutions. Power requirements for data centres. Challenges of cloud-centric data centres. Cloudlet. Cloud programming and deployments. Multi-layer cloud applications. Resource Management. Virtualization and virtual machines. Resource sharing. Memory vitalization. CPU emulation and virtualization. IO-CPU interactions. Software-defined network vs software-defined storage. Cloud Storage. Data organization and storage. Data and data taxonomy. Big data scaling and management. File system design. Hadoop Distributed File System (HDFS) and Ceph File System (CephFS). Types of databases and design trade-offs. Cloud objects. Cloud database. Programming Models. Parallel and distributed programming models. MapReduce. Spark. GraphLab. Spark Streaming. Scheduling and fault tolerance concepts. Iterative Data-Parallel Analytics with Apache Spark GraphLab. Parallel Analytics with GraphLab 2.0 (PowerGraph). Introduction and history of IoT. Internet technology and Communication protocols. Low energy technology. Embedded systems and real-time computing. Application of IoT. Smart cities. Smart grid network. Smart healthcare. Smart weather systems. Industry 4.0. IoT Security. Types of IoT treats. The solution to IoT treats. Blockchain technology. Data aggregation and management. IoT big data. IoT Edge design. IoT Fog design. Practical development of simple IoT-based application. Sensors and wireless sensor networks. IoT design architectures. IoT-cloud integration. Real-time IoT data ingestion and analysis.

EDSU-CPE 412: Artificial Intelligence and Knowledge Engineering (2 Units C: LH 30)

Senate Approved Relevance

Machine learning skill is one of the in-demand skills in the labour market with a very high economic prospect that can alleviate youths from poverty and is in line with the mission of EDSU. It addresses goals 1 and 2 of the SDG and positions the Edo state for economic emancipation. Computer engineers are trained with the acquisition of cloud computing and Internet-of-Things skills that are deployable in wearable devices, sensor networks, e-health, m-health, block-chain, internet, web, and remote services for commercial, individual, and government organisations.

Overview
In this course, you will learn what Artificial Intelligence (AI) is, explore use cases and applications of AI, and understand AI concepts and terms like machine learning, deep learning and neural networks. You will be exposed to various issues and concerns surrounding AI such as ethics and bias, & jobs, and get advice from experts about learning and starting a career in AI. An introduction to the basic principles, techniques, and applications of Artificial Intelligence.

Coverage includes knowledge representation, logic, inference, problem-solving, search algorithms, game theory, perception, learning, planning, and agent design. Students will experience programming in AI language tools. Potential areas of further exploration include expert systems, neural networks, fuzzy logic, robotics, natural language processing, and computer vision. You will also demonstrate AI in action with a mini-project. Knowledge Engineering offers detailed concepts about knowledge representation, logic, reasoning and principles. It includes the introduction, knowledge acquisition, knowledge representation and reasoning. It does not entirely focus on the theoretical concept but also strongly focuses on practical skill-based learning.

Course Objectives
Information system, database creation and management are designed to:

1. describe supervised and unsupervised learning and apply the most suitable machine learning algorithm
2. discuss what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence
3. describe how Artificial Intelligence enables capabilities that are beyond conventional technology, for example, chess-playing computers, self-driving cars, robotic vacuum cleaners
4. discuss theoretical as well as practical knowledge of knowledge engineering
5. discuss the critical analysis and design skills for implementing and managing of knowledge engineering

Learning Outcome
At the end of this course, students are expected to be able to:

1. explain supervised and unsupervised learning and apply the most suitable machine learning algorithm
2. identify what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence
3. explain how Artificial Intelligence enables capabilities that are beyond conventional technology, for example, chess-playing computers, self-driving cars, robotic vacuum cleaners
4. illustrate theoretical as well as practical knowledge of knowledge engineering
5. demonstrate critical analysis and design skills for implementing and managing of knowledge engineering

Course Contents
Concept and applications of Artificial Intelligence. Basics of Neural Networks. Back Propagation and Related Training Algorithms. Different Types of Neural Networks. Practical applications of Neural Networks. Classification, Forecasting, Pattern Recognition. Use of the ANN MATLAB toolbox. Basics of Fuzzy Set Theory and Fuzzy Logic Control. Fuzzy System Models and Developments. Membership Functions and their roles in the Fuzzification process. Defuzzification Methods. Design of Fuzzy Controllers. Fuzzy Time Series Forecasting. Use of the fuzzy logic MATLAB toolbox. Basics and application of Neuro-Fuzzy systems. Genetic Algorithm (GA).

Particle Swarm Optimization. ANFIS MATLAB toolbox. Information and knowledge. Knowledge engineering and Knowledge management. Artificial intelligence in knowledge Engineering. Knowledge-based system and its applications. Conceptual Data Modeling. Semantic Web Technologies and Ontology Reading. Introduction to Ontologies and Ontology Web Language (OWL). Ontology Engineering and Lexical Semantics. Ontology-based software engineering. Enhanced Search and Retrieval. Integration and interoperability. Linguistic Linked Data. Ontology-based service-oriented architectures. Ontologies in Medical Informatics, RDF Queries, Graph, and NoSQL databases.

EDSU-CPE 415: Biomedical Engineering and Bioinformatics (2 Units E: LH 30)

Senate Approved Relevance
This course is positioned to produce high-quality skilled manpower that would solve human problems in all aspects of life, in line with EDSU mission and also in pursuance of global health and well-being according to the objectives of SDG goal 9. Computer engineers are trained with the acquisition of biomedical and bioinformatic skills that are deployable in artificial heart, bionic eye, magnetic resonance imaging, genome, DNA, proteomics, tissue and biological engineering for telemedicine, remote patient monitoring and mobile health (m-health) technologies.

Overview
Biomedical Engineering is the application of basic engineering concepts to solving biomedical problems, with examples from cutting-edge technologies such as the artificial heart, bionic eye, magnetic resonance imaging, and tissue engineering. In this course, you will learn about the fundamental principles, technologies, and issues surrounding biomedical engineering. The topics cover a diverse range, including but not limited to: physiological fundamentals, therapeutic devices, implantable devices, tissue engineering, biomedical signal processing, and regulation of medical devices.

This course is designed to give students both a theoretical background and a working knowledge of the techniques employed in bioinformatics and biomedical engineering. Lectures will be given by faculty experts in the area of biomedical engineering. The goal is to give beginning students an appreciation for the breadth of the field and equip them with practical knowledge for the development of simple and complex engineering tools (software and hardware) for developing medical equipment.

Course Objectives
The objectives of the course are to:
1. discuss variety of currently available genomic
2. describe the principles and applications of microarrays
3. analyze biological sequences and interpret the results of their analyses
4. discuss problem-formulation and problem-solving skills for approaching engineering problems
5. review basic circuit elements with their application in the development of medical systems
6. discuss the conservation equations to solve problems in biology and medicine and to model biological and medical systems

Learning Outcomes
At the end of this course, the students will be able to:
1. identify currently available genomic
2. explain the principles and applications of microarrays
3. compare biological sequences and explain the results of their analyses
4. demonstrate problem-formulation and problem-solving skills for approaching

engineering problems
5. identify basic circuit elements with their application in the development of medical systems
6. explain the conservation equations to solve problems in biology and medicine and to model biological and medical systems

Contents
Introduction and historical overview of biomedical engineering. Moral and ethical issues of biomedical engineering. Application areas of biomedical engineering. Human anatomy and physiology. Biomechanics. Basic circuit theorem and circuit elements. Analogue electronics. Digital filter design and applications. Time-varying signals analysis. Bioinstrumentation design. Biosensors. Biopotential measurements. Physical measurement. Biosignal processing. Characteristics of biosignals. Physiological origin of biosignals. Signal acquisition. Frequency domain of biological signals. Linear, signal averaging. Wavelet transformation. Short-time Fourier transform. Descriptions of genetic and biological databases. Tools for retrieval and analysis. Introduction to proteomics and protein identification. Molecular modeling and methods to determine protein structure. Evaluation of biological data using bioinformatic techniques. Manipulating DNA and protein sequences. Finding homologues. Sequences analysis. Construction and interpretation of evolutionary trees. Analyse protein sequences. Identification and retrieval of proteins structures from databases. Interpretation of protein structures. Structure determination. Homology modeling and computational drug design. The Query of biological data. Interpretation of models and biological information. Application of biological models in molecular data. Coding in clinical care and billing. Terminologies and ontology mapping. Security and privacy in HIPAA and HITECH. Mobile health and telemedicine. Human-computer interaction. Decision support systems. Quality reporting. The Affordable Care Act and Clinical laboratory informatics.

500 Level

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

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 knowledge and understanding of engineering, management and financial principles and apply these to their own work, as a member and/or leader in a team, to manage projects and in multi-disciplinary environments;
3. conduct, manage and execute projects in multi-disciplinary areas;
4. possess the skills needed for project management; and
5. work within the budget when executing a project for proper management.

Course Contents
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.

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

Learning Outcomes

Students will be able to:

1. describe and explain the basic concept, sources and aspects of law;
2. describe and explain the major differences between the various categories of law, courts and legal jurisdictions;
3. describe and explain legal principles and their application in professional engineering design and management services and their professional liability implications; and
4. develop reasoned analysis of real-life or hypothetical engineering scenarios using the legal principles undertake critical analysis of reliable information to develop, and practically present technical reports for use in varying judicial/quasi-judicial settings including as an expert witness.

Course Contents

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.

CPE 501: Testing, Reliability and Maintainability (2 Units C: LH 30)

Learning Outcome

Upon successful completion of this course, the student will be able to:

(Knowledg-Based)

1. apply engineering techniques to prevent or reduce frequency of failures;
2. identify and correct the causes of the failures on engineering systems;
3. apply engineering techniques to estimate the reliability of new designs and analyse reliability data; and

(Skills)

1. predict expected life of the specific component, product or system; and establish risk analysis and quality control on engineering systems.

Course Contents
Introduction to reliability, maintainability, availability, elementary reliability theory; application to power systems and electronic components; test characteristics of electrical and electronic components; types of fault; designing for higher reliability; packaging, mounting, ventilation; protection from humidity, dust.

CPE 502: Digital Signal Processing (3 Units C: LH 45)

Learning Outcomes
At the end of this course, the students will be able to:
1. understand analytical tools such as fourier transforms, discrete fourier transforms, fast Fourier transforms and Z-transforms required for digital signal processing;
2. get familiarized with various structures of IIR and FIR systems;
3. design and realise various digital filters for digital signal processing; and
4. understand the applications of DSP in speech processing and spectrum analysis.

Course Contents
Discrete signals and Z-transform, digital fourier transform, fast fourier transform; the approximation problem in network theory; synthesis of low-pass filters; spectral transforms and their application in synthesis of high-pass and band-pass filters; digital filtering, digital transfer function aliasing, one-dimensional recursive and non-recursive filters; computer techniques in filter synthesis, realisation of filters in hardware and software; and basic image processing concepts.

CPE 505: Digital System Design with VHDL (2 Units E: LH 30)

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. gain proficiency with VHDL software package and utilise software package to solve problems on a wide range of digital logic circuits.

Course Contents
Finite state machine: definition, mealy and Moore models, state diagram, state table, transition table; sequential circuits design using flip-flops, asynchronous and synchronous circuit design; algorithm state machine; design examples and exercises; structured design: design constructs, design levels, geometry-based interchange formats, computer-aided electronic system design tools, schematic circuit capture, hardware description languages, design process (simulation, synthesis), structural design decomposition; introduction to VHDL: VHDL language abstractions, design hierarchies, VHDL component, lexical description, VHDL source file, data types, data objects, language statements, concurrent VHDL, sequential VHDL, advanced features of VHDL (library, package and sub-programmes); 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, optimisation and

mapping, constraints, technology library, delay calculation, synthesis tool, synthesis directives; and computer-aided design of logic circuits.

CPE 511: Machine Learning and Applications (3 Units C: LH 45)

Learning Outcomes

On the successful completion of this unit, students should be able to:

1. identify the characteristics of datasets and compare the trivial data and big data for various applications;
2. select and implement machine learning techniques and computing environment that are suitable for the applications under consideration;
3. solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues;
4. understand and apply scaling up machine learning techniques and associated computing techniques and technologies;
5. recognise and implement various ways of selecting suitable model parameters for different machine learning techniques; and
6. integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop and mapreduce.

Course Contents

Introduction to machine learning; ; introduction to R or Python for machine learning: statistics for analytics: descriptive statistics, inferential statistics, estimation and hypothesis testing, ANOVA; machine learning: unsupervised learning – clustering, supervised learning – classification, decision trees, random forest, and model performance measures.

CPE 514: Professional Practice and Ethics (2 Units E: LH 30)

Learning Outcomes

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

1. have a holistic picture of professional practice in computer engineering;
2. be abreast of the ethical and professional issues and landmines inimical to their practice and how to navigate them;
3. be totally ready (professionally, technically, legally and emotionally) for any professional entrepreneurial, financial and managerial challenges they may encounter; and
4. be abreast of the standards, codes and intellectual property implications of and values associated with, professional practice.

Course Contents

Engineering profession: structure and specializations (Nigeria and abroad), engineering basics, development of engineering profession, ethics and computer engineering, strands in ethical thinking, organisations and their structures: limited liability companies, private and public, partnerships, sole traders, special features of limited companies, responsibilities of directors; company finance: the need for capital; investment and working capital; sources of funds; equity capital and loan capital, cash flow and its importance, costing: fixed costs and variable costs; overheads; opportunity costs; depreciation; problems of cost allocation; budgeting; assessment of capital investment; discounted cash flow analysis, with particular reference to investment in software tolls and new product development; financial accounts: balance sheets, profit and loss accounts, cash flow statements; the treatment of software in company accounts; ownership of rights in software as goodwill; anatomy of software house: the company, company structure, management of staff, producing of budget, monitoring financial

performance, producing budgets, computer contracts and intellectual property rights: the nature and types of intellectual property; intellectual property law (confidentiality, copyright, trademarks, and patents) and implications for the computing, computer engineering and software industry; computer misuse and criminal law: computing and criminal activity, reform and criminal law, categories of misuse, computer fraud, unauthorized access ;data protection: data protection and privacy, the impact of the internet; sociology of data management/processing: generation, users, regulation/control and general management; Professional and industry codes of conduct(local and international).

CET 599: Final Year Project (6 Units C: LH 270 PH)

Learning Outcomes

The student(s) will develop a technology and/or system to solve a known and significant computer engineering problem and 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.

Course Contents

Individual student or group of students' projects undertaken to deepen knowledge, strengthen practical experience and encourage creativity, entrepreneurship and independent/team work (as may be the case). The project ends in a comprehensive written report of a developed system, and/or product/service and oral presentation/defense before a panel of assessors one of whom must be external to the University awarding the computer engineering degree.

EDSU-CPE 512: Information System: Database Creation & Management (2 Units E: LH 15, PH 45)

Senate Approved Relevance

The training of high-quality computer engineers is in line with EDSU mission to produce high-quality graduates with skills in building and deploying databases and information system towards the economic advancement of Edo state, Nigeria and Africa at large through bridging the gap in the supply of technical capacity in ICT, especially in the high-profile task of systems analysis and design, database administrators, security engineers, thereby reducing unemployment by at least 20% annually and in pursuant of the SDG goals 1, 2, and 9.

Overview

An information system is a combination of software, hardware, and telecommunication networks to collect useful data, especially in an organisation. In Edo State and its environs, many businesses use information technology to complete and manage their operations, interact with their consumers, and stay ahead of their competition. Such systems have the potential of boosting economic activities and enhancing entrepreneurial engagements that have the potential of alleviating poverty and hunger in the region. The development, deployment, and maintenance of such a system requires high-level and skilled manpower. Such skilled manpower is the most hunted in the tech industries across the nation and the world at large. Few available manpower in this area is either not well equipped with employable skills or are not current with trend in industries for the development, installation and maintenance of information systems.

This course intends to train students of EDSU and equip them with the needed skill to be able to create and deploy databases and information systems that would support businesses and entrepreneurship in Edo State and beyond. This course introduces information systems analysis, database design, and creation using a DBMS product. Emphasis is placed on data

dictionaries, normalization, security, data integrity, data modeling, and creation of simple tables, queries, reports, forms, and database administration. Upon completion, students should be able to design and implement normalized database structures by creating simple database tables, queries, reports, and forms.

Course Objectives

Information system, database creation and management is designed to:

1. describe the basic concept of information system
2. discuss the principles of systems analysis and design
3. identify the steps involved in systems analysis and design
4. describe the process of database schema development
5. relate the schema design and development of databases
6. review the application of structured query language (SQL) in the management of database and information systems
7. discuss database security and database administration
8. discuss the concepts of information system and database project management

Learning Outcome

At the end of this course, students are expected to be able to

1. explain the concept and structure of a simple information system
2. explain the concept of systems analysis
3. carry out simple systems analysis and design using school information systems, retail store information systems, hospital information systems, etc.
4. demonstrate a simple design a schema database system
5. apply schema design in the development of simple and complex database systems
6. implement simple SQL application for the management of database systems
7. explain the various security architecture for database administration
8. explain the principles of information and database systems project management
9. document all analysis and design procedures for both databases and information systems

Course Contents

Overview of Information system and types of information. Concepts and applications of database technology. Logical and physical organization of the database. Database models (Entity-relationship model, hierarchical, network and relational data models, and their languages). System analysis and design. System development life cycle. Functional dependencies, normal forms and decompositions. Designs, implementation, and optimization of query language. Practical creation of databases. Introduction and applications of structured query language. Overview of database management tools. Overview of Oracle database management. Database economics. Security, consistency, and data integrity. Database administration and system security. Distribution database systems. Introduction to knowledge-based and expert systems.

EDSU-CPE 513: Mobile & Web Apps Development (2 Units E: LH 15, PH 45)

Senate Approved Relevance

Training graduate who are highly skilled in creating simple and complex mobile and web applications that have potential of solving problems for industries is in line with the mission of EDSU by producing computer engineers who would apply both technical knowledge and entrepreneurial skills in promoting the economic need of the Edo State, Nigeria and the world at large and reduce extreme hunger, addressing the goals 1 and 2 of the SDG.

Overview

Business and almost all forms of economic activities in this modern time depend on the internet, which hosts different forms of applications. Mobile devices and desktop computers have also become inevitable tools for modern life. The demand for applications that would run on mobile and other computing devices is on the increase, with very little manpower to provide the needed services in this area. EDSU is positioned and ever committed to developing human capacity that can bridge the gap in knowledge and technical services. The acquisition of such skills requires a specialised course such as this to provide the direction for students of EDSU to knowledge that would prepare them for a career in web development and mobile application development in line with industrial standards and expectations.

In this course will empower students to gain experience in the designing and deployment of web-based and mobile-based applications following a user-centered design process, with a focus on effective user interface design. This also gives students the opportunity to specialize in front-end development, and back-end programming, or become full-stack developers, this concentration is right for you.

Course Objectives

The objectives of the course are to:

1. review the internet technology and how it affects web and mobile software applications
2. review data communication concepts used in web and mobile application development
3. describe the model for mobile computing and web application framework
4. identify the tools for mobile and web application development
5. outline the procedure for mobile and web application development
6. identify and describe security issues with mobile and web applications
7. describe streaming tools and usage procedures for web and mobile application contents
8. describe the architecture for contending security loopholes in mobile and web-based applications

Learning Outcome

At the end of this course, students are expected to be able to

1. discuss the internet technologies that affect web and mile applications
2. discuss data communication technologies used in web and mobile application development
3. explain the framework for mobile computing and web application development
4. explain the procedures and features of tools used for the development of mobile and web applications
5. implement simple UI (frontend) for both mobile and web applications using adobe Photoshop, Adobe Illustrator, Figma, CSS, HTML, Javascript, etc.
6. implement simple back-end using PHP, MYSQL, Laravel, Python, MongoDB, Posgress, Java, Node.js, etc
7. implement simple communication protocol for streaming web and mobile application contents
8. implement basic security infrastructure for mobile and web application
9. optimize the performance of mobile and web applications

Course Contents

Infrastructure and Organization of Internet, Addressing and DNS System. OSI communication model, standard and Internet Routing. Internet Client-Server Models. Classical Internet Services. Internet Multimedia Services. Business Systems & Internet Security. Internet communication networks. Introduction to Mobile Computing. Android Development Infrastructure and Environment. Factors in Developing Mobile Applications. Mobile Software Engineering, Frameworks and Tools. Generic UI Development. VUIs and Mobile Apps. Text-to-

Speech Techniques. Multichannel and Multimodal UIs. Intents and Services. Android Intents and Services, Characteristics of Mobile Applications. Storing and Retrieving Data. Synchronization and Replication of Mobile Data. Content Provider Communications Via Network and the Web. State Machines. Communications Model. Android Networking and Web. Scope of an App, Wireless Connectivity and Mobile Apps. Android Telephony. Web programming. PHP and MySQL. Introduction to Laravel Framework (MVC). Human-computer interactions.

EDSU-CPE 515: Robotics and Cyber-Physical Systems Engineering (2 Units C: LH 15, PH 45)

Senate Approved Relevance
Training highly skilled graduates who are innovative in driving the future of industrialization through technology and the ability to design, install, manage, and maintain complex industrial settings using the modern technological tool is in line with EDSU's mission of producing computer engineers who are competent in robotics and industrial automation and directed towards achieving SDG goals 6, 9, 11, and 14.

Overview
The localization of quarry and cement industries with mechanised and automated machines within Edo North opens up an opportunity for EDSU to think about the future of such industries. Industry 4.0, smart grid, and smart cities are the direction of the future technology. Robotics and cyber-physical systems engineering are well positioned to equip and prepare students for that future. The manpower product of the course would provide skills that would be able to provide solutions for automating the activities of the quarry and cement industries in the area, as well as improve water and air quality through effective monitoring and control. The skills obtainable in this course would fill the gaps of large industries across the world in the areas of robotic engineering, plant management, and maintenance, process control, job scheduling, etc.

Students will be able to design engineering systems that interact with humans & environment, creating solutions that are poised towards environmental monitoring and control, intelligent industrial machines, smart grid, and self-healing systems for industries within Edo State, Nigeria and the world at large. The course will cover such important areas as robotic design methods, automation, advanced control system engineering, complex systems analysis, system optimization, internet integration of machinery, mechatronics at the basic level, PLC, and SCADA.

Course Objectives
This course is designed to:
1. review the concept of robotics and cyber-physical systems (CPS) and industry 4.0
2. discuss the application of robotics and cyber-physical systems
3. describe robot control systems and industrial automation
4. describe the mathematical relationship between the end effector position and the angle of inclination
5. describe the mathematical relationship between forces on the joints and the angle of inclination
6. describe sensors and their applications in robot and automated systems design
7. describe sensor networks, cloud computing, and architectures
8. describe tools for modeling and simulation of robotics systems, industrial processes, and automation
9. evaluate the performance of robotic systems
10. describe the development and integration of IoT and robotics system for modern industrial automation

Learning Outcome

At the end of this course, students are expected to be able to

1. define basic concepts of IoT, CPS, Robotics, and mechatronics
2. explain the application of robots in different fields of human endeavours
3. demonstrate the design and application of real-time embedded systems and artificial intelligence in robot control and industrial automation
4. calculate the kinematics of a robot end effector
5. calculate the dynamics of robot joints
6. explain different types of sensors and their uses in automated machines and robotics systems
7. illustrate cloud-based sensor network with typical industrial machine control and automation
8. develop simple models of robotic systems and automated industrial machines using MATLAB, and Maplesim
9. simulate and analyse the parameters of virtual models of robotic systems
10. develop a simple smart robotic system with an integrated embedded IoT and cloud control system

Course Contents

Definitions, History, classification, types, and application of robots. Forward and inverse kinematics. Forward and inverse dynamics. Joint types, degree of freedom. Sensing and Actuation. Application of sensors and actuator in robotics. Workspace analysis and trajectory planning. Robot and human. Robot Control systems. Fuzzy logic control. Proportional, Integral PI, PD, and PID control. Programmed control, fuzzy logic, and Artificial Intelligence control. Fundamentals of automation. Laboratory experiments. Programming and simulation of various aspects of robots. MATLAB and MapleSim. Definitions and applications of Cyber-Physical Systems (CPS). Introduction to real-time and embedded systems. Communication protocols for real-time applications. Continuous Dynamics (modeling physical components). Discrete Dynamics, Hybrid Systems, Composition of State Machines and real-time operating systems. Basic techniques of low-power devices. Concepts of internet of things (IoT). Wireless sensor networks and Smart Systems. Open and Closed loop control system. Elements of mechatronics systems. Concept of transfer function. Applications of mechatronics. Data Acquisition & Microcontroller System. Modeling and Analysis of Mechatronics System. Introduction to PLC and SCADA system.

EDSU-CPE 516: Introduction to Cybersecurity and Cyberpreneurship (2 Units E: LH 30)

Senate Approved Relevance

Training high-quality manpower that would contribute to the economic advancement of Edo state, Nigeria, and Africa at large is in line with the EDSU mission and goal to address the challenge of producing highly skill-oriented computer engineers from EDSU being able to bridging the gap in the supply of technical capacity in ICT, especially in security solutions and internet-based entrepreneurship, thereby reducing unemployment by at least 20% annually in pursuance of the SDG goals 1, 2, and 9.

Course Overview

Internet businesses today are faced with the dreaded fraudsters and scammers, posing security threats to legitimate users and cuberprenures. Mitigating such security issues is a serious challenge facing the internet industry. EDSU is committed to delivering human capacity development courses that train students on the skill needed to fight internet fraud.

Students offering this course would be able to defend against cyber-attacks and security breaches and protect the cyberspace of government and other business organisations against vulnerabilities. The course also provides an opportunity for learners to develop skills that enables them to take advantage of the economic opportunities available in the cyberspace. The course will address specific concern in security for mobile, web and desktop applications in relation to their internet communication structure, security risk management and administration of defense mechanisms, business insight into the modern-day internet market, and many more.

Course Objectives

The objectives of the course are to

1. describe the concept of cyberpreneurship
2. describe the basic concept of cybersecurity
3. describe the legal, and ethical framework for cyberpreneurship in contexts with cybersecurity
4. describe the nature and structure of a cyber-business plan
5. identify types of cyberpreneurship business engagements and social media networks
6. identify the impact of cyber-crimes and threats with solutions in a global and societal context
7. identify techniques of defense against each threat, and modern cryptographic principles
8. discuss the techniques for monitoring, protection, and defense against cyber threats

Learning Outcome

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

1. explain the concept of cyberpreneurship
2. explain the concept of cybersecurity
3. explain governance, regulatory, legal, economic, environmental, social, and ethical cyberpreneurship and the cybersecurity implications
4. develop a simple cyberpreneurship business plan
5. explain the nature of different online businesses and social media networks
6. discuss the impact of cyber-crimes and threats with solutions in a global and societal context
7. discuss different threat defense mechanisms
8. implement threats identification and defense in modern digital systems

Course Contents

Human and Organisational Regulation. Risk Management and Governance. Cyber Law and Regulation. Privacy and Online Rights. Malware Attacks and Defenses. Attack Technologies. Adversarial Behaviours. Security Operations, Incident Management, and Forensics. Systems Security (Cryptography, Operating Systems and Virtualisation). Distributed Systems Security. Authorisation and Accountability. Software and Platform Security. Web and Mobile Security. Secure Software Design and Development. Network Security. Hardware Security. Cyber-Physical Systems Security. Physical Layer Security. Introduction to creativity and innovation. Commercialization of creative and innovative ideas. Trends in technology development. Entrepreneurship management and ownership. Risk management. Business Plan and Development. Forecasting developments and action plans. Market research and feasibility study. Financing business. Nigerian Entrepreneurship. Overview of the Nigerian Legal System. Intellectual property and copyright. Ethics and Etiquette.

EDSU-CPE 517: Operations Research (2 Units E: LH 15, PH 45)

Senate Approved Relevance

In line with EDSU mission for lifelong learning, the training of computer engineers with good knowledge of operations research will deepen the quest for continued learning through research

and discovery, especially in finding solutions to different problems of any sector of local and global economic sectors, which also aims at achieving the objectives of the SDG goal 4.

Course Overview

The course aims at building capabilities in the students for analysing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints. The objective of this course is to enable the student to understand and analyse managerial and engineering problems to equip him to use the resources such as capital, materials, productions, controlling, directing, staffing, and machines more effectively.

With this course, we intend to produce manpower who would to understand and analyse managerial and engineering problems to equip them to use the resources such as capital, materials, productions, controlling, directing, staffing, and machines more effectively.

Course Objectives

The objective of the course is to:

1. describe the use of variables for formulating complex mathematical models in management science, industrial engineering, and transportation science
2. describe the various software tools for solving linear programming and integer programming models
3. describe the concepts of polyhedral theory and valid inequalities and how to integrate the theory to the solution methods for integer programming.
4. describe large-scale transportation and assignment problems
5. describe the concept and techniques of optimization and minimization
6. describe cost and queuing theorems, gaming theory, and network theorems

Learning Outcome

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

1. explain variables and their application in the formulation of complex mathematical models
2. implement linear simple linear programming solutions using TORA, WinQSB
3. explain the concept of polyhedral theory and valid inequalities and how to integrate the theory to the solution methods for integer programming
4. solve problems involving transportation Models and Assignment Models
5. determine the optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding the initial basic feasible and optimal solution of the Transportation problems
6. develop the optimization of the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of the number of jobs by the number of persons
7. develop models for competitive real-world phenomena using concepts from game theory, formulate network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these network problems

Course Contents

Introduction to Operations Research (OR). Operation research model. Linear programming and two-variable Linear Programming model. Graphical Linear Programming. Practical Linear programming with Excel. Sensitivity analysis. Equation of algebraic solution. Simplex method. Duality and post-optimal analysis. Network Analysis. Decision Theory. Transportation problems. Simulations and Queuing systems. Queue Theorem. Job/task scheduling and Dispatch. Optimization of profit/production cost. Software performance optimization.

EDSU-CPE 518: Advanced Machine Learning Applications (2 Units E: LH 15, PH 45)

Senate Approved Relevance

Training students with Machine learning skills are in line with the mission of EDSU mission develop human capacity who are highly skilled computer engineers and advanced in knowledge for providing technical services in industries, and addressing goals 1 and 2 of the SDG, and positioning the Edo state for economic emancipation.

Course Overview

Machine learning methodologies imitate the human thinking processes in finding solutions to problems. Numerous problems facing engineers, businesses, and governments can be solved by tracking and analysing pieces of information that humans may not be able to pay attention to. Developing a system that can harness such information might be able to find insight from the data, leading to better-informed decision-making for business growth and effective governance. The task requires a well-structured skill set, which this course would provide. Systems intelligence through machine learning deployment is the direction of most businesses, and the demand for such skills is very high globally with very few qualified persons to satisfy this need. The training of students with hands-on experiences becomes a necessity for this course.

The course would equip students with skills for developing data processing and analysis applications, using algorithms like Neural Networks, Adaptive learning, etc. Students can develop machine learning-based software products for both mobile, web, and desktop.

Course Objectives

The course is designed to:

1. describe the key concepts of machine learning, Artificial intelligence, and computational learning theory
2. describe the mathematical relationships of common machine learning algorithms
3. review basics of python for machine learning and data science, and python machine learning libraries
4. review Clustering and other forms of unsupervised learning
5. review Artificial Neural Networks and Adaptive learning algorithms

Learning Outcome

1. explain the basic concepts of machine learning and artificial intelligence
2. derive simple mathematical models for common machine learning algorithms
3. write simple python codes for machine learning and data science applications
4. build machine learning models using python libraries such as pandas, keras, sklearn, etc.
5. implement classification algorithms for various engineering problems
6. implement different models for Artificial Neural Networks and fuzzy logic
7. apply developed models in solving real-world problems

Course Contents

Introduction to learning systems. Artificial intelligence vs machine learning. Goals and applications of machine learning. Machine learning models. Mathematical relationships of classifier models. Mathematical relationships of regression models. Mathematical relationships of time series models. Mathematical relationships of semi-supervised and unsupervised models. Basics of python programming. Python tools for machine learning and data science. Learning system development. Knowledge engineering. Concept of data representation. Inductive Classification: The concept learning task. Finding maximally specific hypotheses. Learning with Decision Tree. Recursive induction of decision trees. Ensemble Learning. Bagging, boosting,

and DECORATE. Active learning with ensembles. Measuring the accuracy of learned hypotheses. Comparing learning algorithms. Cross-validation, learning curves, and statistical hypothesis testing. Computational Learning Theory. Models of learnability. Probably approximately correct (PAC) learning. The Computational complexity of training. Rule-based Learning. Propositional and First-Order. Translating decision trees into rules. Heuristic rule induction using separate and conquer and information gain. First-order Horn-clause induction. Learning recursive rules. The Inverse resolution, Golem, and Progol. Artificial Neural Networks. Neurons and biological motivation. Linear threshold units. Perceptron. Multilayer networks and backpropagation. Support Vector Machines. Maximum margin linear separators. Time Series Analysis. Deep Learning. Quadratic programming. Kernels for learning non-linear functions. Bayesian Learning. Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logistic regression. Markov nets for dependencies. Instance-Based Learning. Constructing explicit. k-Nearest-neighbor algorithm. Case-based learning. Text Classification. Bag of words representation. Vector space model and cosine similarity. Relevance feedback and Rocchio algorithm. Clustering and Unsupervised Learning. Clustering. Hierarchical Agglomerative Clustering. k-means partitional clustering. Expectation maximization (EM). Semi-supervised learning with EM using labeled and unlabeled data. Language Learning: Classification problems in language and Hidden Markov models (HMM's). Veterbi algorithm. Forward-backward EM algorithm. Conditional random fields (CRF's). Probabilistic context-free grammar (PCFG).

EDSU-ENT 421 Entrepreneurship Development (C, 1 unit; LH 30).

Senate-approved relevance

There is no market for vision, and turning the vision into a solution makes a real entrepreneur. One of the greatest challenges of entrepreneurs is staring-up. Having trained and equipped graduates with creative, productive, and innovative knowledge, a key to achieving the vision of Edo State University of graduating competitive graduates is the provision of the opportunity to put the knowledge to practice. One of the channels of achieving this is through entrepreneurial competition which is the main content of this course. This is important as it will help the students to take the step of putting their vision into solution provision, and source of capital for the winner.

Learning objectives

The learning objectives of this course are to:

1. Explain the various models of wealth creation
2. Analyze a profitable and innovative business idea.
3. Examine the capacity of the student to develop a business plan to start a business.
4. Demonstrate the preparation of a proposal on a remarkable and innovative business idea/plan in different fields of study.

Learning Outcomes:

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

1. Explain at least one model of wealth creation
2. Prepare a profitable and innovative business idea.
3. Develop one business plan to start a business.
4. Prepare a proposal on a remarkable and innovative business idea/plan in their field of study

Course Contents

Models of wealth creation. Requirements in preparing an innovative business plan. Sustainability strategies. Managing business growth, time, and self-management. Students are to prepare and defend a competitive business idea/plan where the winner gets an award.

Minimum Academic Standards

Equipment
Recommended List of Minimum Equipment

Basic Computer Laboratory		
S/N	Name of Equipment/Brief Specification	
1.	Computer System (with latest configurations)	
2. 3. 4. 5. 6. 7. 8. 9. 10.	Software Microsoft Windows Red Hart Linux Oracle Page Maker Professional (latest version) Corel Draw (latest version) Adobe Photoshop Microsoft Office Suite (latest version) Antivirus Software (licensed for at least 200 users)	
Programming Laboratory		
1.	Computer System (with latest configurations)	
2.	Turbo C and C++ Compilers (latest versions)	
3.	VB.Net (latest version)	
4.	Javas Compiler (latest version)	
5.	Python compiler (latest version)	
6.	R Compiler (latest version)	
7.	Antivirus Software (licensed for at least 50 users)	
Digital Electronics and Microprocessor Laboratory		
1.	Computer System (with latest specifications)	
2.	Online UPS (5 KVA) OR 625 VA UPS for each Computer System	
3.	Assembler for 8085 programming	
4.	Antivirus (10 user License)	
5.	8085-based Trainer Kits	
Add on Cards		
6.	Add on card to study interfacing of LED display control using 8255	
7.	Add on card to study interfacing of LCD with 8085-based microprocessor	
8.	Add on card to study speed control of stepper motor using 8085-based microprocessor including stepper motor	
9.	Familiarization o f ICs trainer (7400),(7402), (7432), (7486), (7408), (7404), (7483), (7485), (74157), (74151), (74138	
10.	EX OR, and EX-NOR Gates realisation kit (using NAND OR NOR Gates)	
11.	Realisation of Truth Table for OR and NAND Gates using NAND Gates and NOR Gate	
12.	8-bit digital multiplexer	
13.	1:8 line de-multiplexer	
14.	Multiplex two BCD numbers to seven segment display	
15.	Study of Flip Flop or RS, D, J-K and T	
16.	3 bit asynchronous up-counter3 bit synchronous down counter	
17.	Universal shift registers having SISO, SIPO, PIPO, PISO	

18.	Study of D-latch and D flip flop trainer	
19.	Encoder/decoder trainer	
20.	Digital IC testers	
21.	Digital Laboratory with modules	
22.	Logic Probe	
23.	Logic Pulser	
24.	Pulse Generator upto (3MHz)	
25.	Digital Frequency Metre	
26.	Digital IC Programmer	
27.	Digital IC power supplies (+/- 5V/1A, +/-12V/1A/+-15V, 1A)	
28.	15 Macs	
29.	2 Calliope autonomous robots with camera and robotic arm	
30.	Apple iPads and Samsung tablets.	
31.	Digitised oscilloscopes with spectrum analysers	
32.	Digitised function generators	
33.	Digitised power supplies	
34.	Digital circuit design and microcontroller boards (EasyAVR and BigAVR microprocessor boards. Easy 8501 development boards).	
35.	Raspberry PIs.	
36.	Protoboards.	
Advanced Computer Laboratory		
1.	Multimedia computer systems with latest specifications	
2.	Online UPS (5 KVA)	
3.	Multimedia projector with accessories	
4.	24 Port Switch	
5.	Digital camera	
6.	Scanner	
7.	Laser printer	
8.	Touch screen	
9.	Laptop with latest configurations	
10.	Adobe Creative Suit (latest Version)	
11.	Visual Studio 6.0 or (latest Version)	
12.	Adobe Flash Professional	
13.	Adobe Flex (latest version)	
14.	Adobe Dreamweaver	
15.	Web camera	
16.	Antivirus (licensed for at least 50 users)	
Hardware Laboratory.		
1.	Trainer board to demonstrate assembling and working of multimedia computer system	
2.	Trainer boards to study mother boards with different chipsets and processors	
3.	Hard disk trainer board (SATA and IDE)	
4.	CDROM trainer board	
5.	Mouse trainer board	
6.	Keyboard trainer board	

7.	Trainer board to study construction and working of colour CRT monitor
8.	Trainer board to study construction and working of colour LCD Monitor
9.	Trainer board to study working of dot matrix printer, Inkjet printer and colour laser printer
10.	Trainer board to study switch mode power supply
11.	Trainer board to study working of UPS
12.	Trainer board to study construction and working of floppy disk drive
13.	Computer repair and assembly tool kits
14.	Computer system with latest specifications
15.	Online UPS (3 KVA)
16.	PC tools
17.	Antivirus (5 users)
18.	USB hard disk
Data Communication and Networking Laboratory	
At least 2Mbps Internet facility should be available in Laboratories.	
1.	Computer system with latest specifications
2.	19" rack
3.	24 port switches
4.	Windows 2003 server or latest version (10 user license)
5.	Red hat linux (20 user license)
6.	Data backup utility software
7.	Data communication trainer board
8.	LAN trainer system
9.	Amplitude modulation/demodulation trainer board
10.	Frequency modulation/demodulation trainer board
11.	Pulse code modulation/emodulation trainer board
12.	CRO 25 MHz (minimum)
13.	Trainer board to study frequency division multiplexing/ demultiplexing
14.	Trainer board to study time division multiplexing/ demultiplexing
15.	Digital multimetre
16.	Wireless access points
17.	Wi-Fi LAN cards
18.	Network/bandwidth management software (cybernetra or equivalent)
19.	Trainer board to study the working of MODEM
20.	LAN cable tester
21.	Crimping tool
22.	Display boards of various types of cables and connectors used in computer networks
23.	Tool kits
24.	Online UPS (5 KVA)
25.	Network printer
26.	Antivirus (10-user license)
Operating System Laboratory	
1.	Computer system with latest specifications

2.	Online UPS (7 KVA) OR 625 VA UPS for each PC	
3.	Server with latest specifications	
Software		
1.	Windows 98/XP/2000/Vista/Windows 7/Windows 10	
2.	Windows 10 server or latest version	
3.	Oracle academic version (latest version with at least 20- user license)	
4.	SQL server	
5.	Antivirus (with at least 20-user License)	
Central Computer Laboratory		
1.	Multimedia computer system with latest specifications	
2.	Online UPS (7 KVA)	
3.	24 port switches	
4.	Network printer	
5.	Scanner	
6.	Dot matrix printer	
7.	Antivirus (20 user license)	
8.	LCD projector	
Electronics/Signal Processing Laboratory		
1.	Digitised Oscillisopes with Spectrum Analysers	
2.	Digitised Function Generators	
3.	Digitised Power Supplies	
4.	Digital Circuit Design and Microcontroller Boards	
5.	Computers for Data Acquisition and Computer Aided Design (CAD	
6.	40 work stations	
7.	Software includes: AutoCAD	
8.	MatLab	
9.	Comsol	
10.	STAAD	
11.	Other engineering design software	

Staffing

Academic Staff

The NUC guidelines on staff/student ratio of 1:15 for Engineering and Technology departments shall apply. However, there should be a minimum of six full-time equivalents of Staff in the department. There is need to have a reasonable number of Staff with doctoral degrees as well as sufficient industrial experience. With a minimum load of 15 Units per semester for students and a minimum of six full-time equivalent of staff in each programme, staff should have a maximum of 15 contact hours per week for lectures, tutorials, practicals and supervision of projects.

NUC requirement encourages all academic staff to have PhD degrees; hence appointment of academic staff is preferably to the Lecturer cadre. Only in exceptional cases are candidates with great promise appointed to Graduate Assistant and Assistant Lecturer positions for the purpose of being developed to the Lecturer cadre as registered PhD candidates.

Academic Support Personnel
Teaching Assistant/Demonstrators to help lecturers in the conduct of tutorials, practicals and field work. This category of personnel is not expected to be regular staff as they are to be paid on the basis of approved hourly rate.

Administrative Support Staff
The services of the administrative support staff are indispensable in the proper administration of the departments and faculty offices. It is important to recruit very competent senior staff that are computer literate.

Technical Support Personnel
The services of technical support staff, which are indispensable in the proper running of laboratories and workshop/studios are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance. The minimum of academic staff to technical staff ratio of 5:1 should be maintained.

Student/Staff Ratio
The minimum staff-to-student ratio should be 1:15 from 200 level to 500 level.

Library
There must be adequate library facilities to cater for the interest of all the programmes in the faculty. These include current journals, handbooks, textbooks, manuals, codes of practice, standards and specifications etc. in sufficient numbers**.**

Library Facilities
The following facilities should be provided to enable users make maximum use of library services.
1. Reading Rooms
2. 24 Hour Reading Rooms
3. Visually Impaired Resource Centre
4. Radio Frequency Identification (RFID) Security gate for theft detection
5. RFID tags for book tagging
6. Notebook computers for loan service
7. Over two hundred computers distributed at the various service points for Database search at the University library and Faculty Libraries
8. Workstations at the Faculty Libraries for Database search
9. Projectors and Screens for presentations
10. Photocopying machines
11. Scanners
12. Visually Impaired Resource Centre
13. Information display screen
14. E-Library (postgraduate and undergraduate sections)
15. Discussion Rooms

Classrooms, Laboratories, Workshops, Clinics and Offices

Space Requirements

The NUC recommends the following physical space requirement:

Academic	**m^2**
Professor's Office	18.50
Head of Department's Office	18.50
Tutorial Teaching Staff Space	13.50
Other Teaching Staff Space	7.00
Technical Staff Space	7.00
Science Staff Research Laboratory	16.50
Engineering Staff Research Laboratory	14.50
Seminar Space per student	1.85
Drawing Office Space (A.O. Board) (Per Student)	4.60
Drawing Office Space (A.I. Board) (Per Student)	3.70
Laboratory Space	7.50
Non-Academic	
Secretarial Space	7.00

Office Facilities

S/No	**Office**	**No in Room**	**Facilities**
1.	HOD	1	Table, chairs, A/C, filing cabinet, bookshelves, computer unit, Secretary and facilities.
2.	Professor	1	Table, chairs, A/C, filing cabinet, bookshelves, computer unit, Secretary and facilities.
3.	Reader	1	Table, chairs, A/C, filing cabinet, bookshelves, computer unit.
4.	Senior Lecturer	1	Table, chairs, A/C, filing cabinet, bookshelves, computer unit.
5.	Lecturer I	2	Table, chairs, fan, filing cabinet, bookshelves.
6.	Lecturer II	3	Table, chairs, fan, filing cabinet, bookshelves

APPENDIX A

List of Reviewers

Title	Surname	First Name	Institution	Programme
Professor	FABORODE	Michael O.	Obafemi Awolowo University, Ile-Ife	**Discipline Chairman**
Professor	OLOCHE	O. B.	University of Abuja, Abuja	Mechanical Engineering
Professor	EKECHUKWU	Onyemaechi Valentine	University of Nigeria, Nsukka	Mechanical Engineering
Engineer	ALI	Kashim	COREN	Mechanical
Professor	OLORUNMAIYE	Adesiji	University of Ilorin,	Discipline
Lt. Col. Dr	IMAM	A.S.	Nigerian Defence Academy, Kaduna	Mechatronics Engineering
Professor	ASERE	Abraham	Elizade University, Ilara-Mokin.	Automotive Engineering
Professor	EDOKPAI	Ralph	University of Benin, Benin-City	Industrial and Production Engineering
Professor	FUBARA-MANUEL	Isoteim	Rivers State University of Science and Technology, Port Harcourt	Marine Engineering
Professor	FAKINLEDE	O. A.	University of Lagos, Lagos	Systems Engineering
Professor	OGBONNA	Chibueze Achimba	Babcock University, Ilishan Remo	Computer Engineering
Professor	BOYI	Jimoh	Ahmadu Bello University, Zaria	Electrical Engineering
Professor	ADEDIRAN	Yinusa Ademola	University of Ilorin	Electrical and Electronics Engineering
Professor	AZOBUOGU	Augustine Chukwuemeka	Nnamdi Azikiwe University, Awka	Electronics Engineering
Professor	NYITMEN	Dominic Saaityo	Nigerian Defence Academy, Zaria	Telecommunication Engineering
Professor	LETON	Tambari Gladson	University of Port Harcourt	Environmental Engineering
Professor	ITODO	Isaac Nathaniel	Joseph Sarwan Tarka University, Makurdi	Agricultural and Biosystems Engineering

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Professor	AJAYI	Ade	Federal University of Technology, Akure	Metallurgical Engineering
Professor	AJAKA	Ebenezer O.	Federal University of Technology, Akure	Mining Engineering
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Professor	ADEMILUYI	Falilat Taiwo	Rivers State University of Science and Technology, Port Harcourt	Petrochemical Engineering
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Professor	WAZIRI	Baba Shehu	University of Maiduguri	Water Resources Engineering
Professor	AYESIMOJU	Kola Oluyomi	University of Lagos	Civil Engineering
Professor	OGUNTI	Erastus O.	Federal University of Technology, Akure	Structural Engineering
Professor	BABATOLA	Olufemi	Federal University of Technology, Akure	Wood Products Engineering
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APPENDIX B

List of NUC Representatives

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Mrs	MICHEAL-AUGUSTINE	Chinenye	Automotive Engineering & Agricultural and Biosystems Engineering
Mr	EMENEM	Chinweokwu	Marine Engineering
Mrs	AKAUBA	Vivian	System Engineering
Mr	AKINOLA	Akinlabi	Computer Engineering
Mr	NWAGWU	James Chile	Electrical Engineering
Miss	ADENIJI	Yemisi	Electrical and Electronics Engineering
Mr	WADA	Arome J.	Telecommunication Engineering
Mrs	ABIMBOLA	Oni	Environmental Engineering
Mrs	OKPEKU	Omoh	Food Science and Technology
Mr	OSEMEKE	Bright	Materials and Metallurgical Engineering
Mr	ZAMUNA	Musa	Metallurgical Engineering
Mr	IBRAHIM	Adebayo	Mining Engineering/ Aerospace Engineering
Mrs	ZANG	Aara A.	Chemical Engineering
Mrs	EYO	Esther	Petroleum Engineering
Mr	IBRAHIM	Adam Mohammed	Petroleum and Gas Engineering (Oil and Gas)
Mr	AHMED	Nakaka	Petroleum and Gas Engineering (Oil and Gas)
Mr	ABORELE	Gabriel	Natural Gas Engineering
Mr	OGUNNUSI	Afolabi	Water Resources Engineering
Mrs	OZICHI	Happiness Madu	Civil Engineering
Mrs	AGBAJI	Stella Ene	Structural Engineering
Mrs	OPARAUGO	Lilian N.	Wood Products Engineering
Mrs	EFFIONG	Itoro	Biomedical Engineering
Mr	NKESHITA	Valentine	Information and Communication Engineering

APPENDIX C

List of Contributors to 30% CCMAS in EDSU Computer Engineering Department

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