1.1 Brief History of ESUT

The Enugu State University of Science and Technology (ESUT) was originally founded as Anambra State University of Technology (ASUTECH) on July 30th, 1980. The University was established as a non-residential multi-campus institution. On establishment, the University which was conceived on a Presidential model after Harvard University made impressive landmarks and stamped its name as the first University of Technology and first State University in Nigeria with her main campus at Enugu. Other campuses that were created later were located at Abakiliki, Awka and Nnewi. At inception, only three faculties namely, Engineering, Science and Technology were established at the two functional campuses at Enugu and Awka.

In 1985, there were major re-organizations and policies resulting in the introduction of new programmes and the merging of the University with its sister polytechnic – IMT. The new faculties created then were faculties of Education, Environmental Sciences, Health Sciences, Law, Social Sciences, Management Sciences and Agric Sciences etc.

The two merged institutions operated unsuccessfully under one Interim Joint Council (IJC) with Prof. Onwumechili as the President and Prof. J.C. Ene of IMT as Deputy until December 1986 when it was demerged.

By 1987 the four campuses had kicked off in earnest with Abakaliki campus housing Agric Sciences and Veterinary Medicine, while Awka campus was for students of Basic Applied Sciences, Law and Social Sciences, Nnewi campus catered for Health Sciences comprising Medicine and Dentistry while the main campus in Enugu housed Engineering, Technology, Management Sciences and the rest. Each of the campuses had a Deputy Vice-Chancellor as the administrative head. In 1991, following the creation of Enugu State from the old Anambra State the new Government changed name from ASUTECH to ESUT.

At that time, the two former campuses of ASUTECH at Awka and Nnewi became the State University for Anambra State which today has been taken over by the Federal Government and renamed Nnamdi Azikiwe University, while the Enugu and Abakiliki campuses on the other hand formed ESUT.

ESUT however retained and adopted all the identities of the old ASUTECH including its main campus, the logo, colour, anthem, philosophy, aims and objectives among others.

This re-packaged University, ESUT, established a new campus at AdadaNkpologwu in Uzo-Uwani Local Government Area where students of Applied Natural Sciences and Social Sciences were located.

These three campuses at Enugu, Abakailiki and Nsukka Zones of the State had four colleges, each headed by a Provost.

College of Engineering at Enugu
College of Agriculture at Abakaliki

College of Applied Natural Sciences at Adada – Nsukka

College of Health Sciences at Abakaliki

The creation of Ebonyi State from the old Enugu and Abia States in 1996 saw ESUT forfeiting its campus at Abakaliki which houses its Colleges of Medicine and Agriculture. The new State (Ebonyi) understandably converted the campuses to a State University known today as (EBSU) Ebonyi State University. ESUT on the other hand re-established its College of Health Sciences at Nsukka until 2005 when it was relocated to Parklane Enugu and named ESUT College of Medicine/Teaching Hospital.

On February 14, 2006, the University under the Vice Chancellorship of Professor Ikechukwu Chidobem was moved from its temporary site at Independence Layout Enugu to a befitting permanent structure built in Nkanu West L.G.A. and named Ebeano City.

1.2 Brief History of Faculty of Engineering

The history of Faculty of Engineering, ESUT is synonymous to the history of ESUT itself being the foundation faculty of the then ASUTECH founded in July 30th, 1980.

The faculty started with five Departments which include; Civil Engineering, Electrical and Computer Engineering, Chemical Engineering, Mechanical/Production Engineering and Metallurgical/Material Engineering. Computer Science and Engineering (now Computer Engineering) and Agricultural Engineering Departments were mounted in 1985 and 1987 respectively.

1.3: The Department of Computer Engineering

Introduction

The Department of Computer Engineering, which is based in the Faculty of Engineering, was established during the 1985/86 Academic Session to lead the way in the area of Computer and related technological development. Since the first NUC Visitation in 1989, the Department has grown from an undergraduate enrollment of 144 students to about 300 at the end of 2021/2022 Academic Session.

The Department offers an undergraduate programme leading to the award of B. Engdegree in Computer Engineering. The department, in addition to an undergraduate programme, has mounted post- graduate programmes leading to the Post Graduate diploma (PGD), Master of Science (M.Sc), Master of Engineering (M.Eng.) and Doctor of Philosophy (PhD) in the specialist areas of Computer Engineering and Information Communication Technology.

The courses offered in the Department for all programmes are constantly reviewed to meet up with cutting–edge technologies in Computer Engineering, The teaching and research facilities are also updated continuously and upgraded to position graduates of the Department to meet the demands of modern-day cutting edge computer technology. To achieve these, the Department has made untiring efforts to recruit very high-caliber academic and technical staff with solid background and professional experiences in research and consultancy on Computer Engineering projects

Internet connectivity gives us unparalleled accesses to a worldwide base of information and the CEE website (www.cee-esut-ng.org), designed and maintained by our undergraduates, was since February 2006.

The department has conducted many seminars and workshops for private and public enterprises, and has been very useful in providing computer engineering and information technology services for the effective operation of some other departments within the University. The department also participated in the giant UNESCO (United Nations Educational, Scientific and Cultural Organization) assisted project for the teaching of science and technology in high schools within Nigeria.

However, our students are also encouraged to register with professional bodies like Institute of Electrical and Electronics Engineering (IEEE), Computer Professional (Registration Council) of Nigeria (CPN), Association of Computing Machinery (ACM),Nigeria Society of Engineering (NSE) and Council of Regulation of Engineering in Nigeria (COREN) etc.

It is worthy of note that the Department has a reputation nationally for high quality research and was rated First in the Year 2000 National Universities Commission (NUC) Ranking of Programmes in Nigerian Universities.

Interestingly too, the Department won the Education Trust Fund (ETF) – sponsored multi-million Naira Center of Excellence (CoE) project on Information and Communication Technology (ICT) in year 2006, after stiff competition with other Universities in the whole of South East geopolitical zone. It is the only Centre of Excellence on ICT in the South East Zone.

1.3.1 Philosophy

The philosophy of the postgraduate programmes in Computer Engineering is to develop highly skilled professionals for the public, private and international organizations, as well as for teaching and research in Tertiary Institutions and for global competitiveness.

1.3.2 Objectives

The principal objectives of the Department of Computer Engineering are the training of engineers who are not only capable of being job creators instead of job seekers. It therefore emphasizes a sound knowledge of engineering principles coupled with a high practical and innovative ability to shoulder a broad spectrum of engineering responsibilities. To this end, the courses offered in the Department are designed to provide the educational training and skills necessary for understanding, planning, designing, operating and maintaining the various processes and operations involved in the modern computer industry. In addition to the teaching programmes, the Department encourages research and development work by the student and the academic staff. This area is taken very seriously by this Department in view of our present economic problems and lack of maintenance of numerous sophisticated machines from overseas dumped into this country. Students are therefore encouraged to develop indigenous computers and computer based solutions which are appropriate for our specific need and environment. They are likewise encouraged to design, assemble and construct the equipment need for this research projects. Emphases is placed on the design and implementation of microprocessor based and microcomputer based instruments and control systems, in order to afford student the opportunity to work with units which approximate to those used in the industries.

1.3.3 Mission Statement

To inculcate in the student the ideals and the significance of engineering discipline in general and computer engineering in particular, in national development with a view to providing the much needed quality manpower in computer engineering, instrumentation and control, information and communication technology, computer utilization, including computer maintenance and management.

1.4 Programme Educational Objectives (PEOs)

State the vision and mission of the institution and/or faculty (School).

1.4.1 Aim and Motto of Enugu state university of science and technology

The university was conceived with the aim to establish an institution that must be closely related to society, its industry and above all, serve as a catalyst in the technological advancement of the people, irrespective of race, creed, gender or political affiliation hence the **University's Motto** remains **"Technology for Service".**

1.4.2 Vision of Enugu state university of science and technology

To be premier university in Africa in capacity development that promotes services to the society through quality teaching, research and community service.

1.4.3 Mission of Enugu state university of science and technology

To promote scholarship, especially in the areas of Science, Management and Technology, thereby ensuring the development of quality manpower that will utilize technology for the service of society.

1.4.4 The Objectives of Enugu state university of science and technology

The following objectives are expected to shape the direction of the University's academic development and orientation:

01: To encourage the advancement of all branches of learning and to avail to all persons without distinction an opportunity of acquiring higher education;

02: To develop and offer academic and professional programmes leading to the award of degrees, diplomas, certificates and other distinctions to persons who attain the standards
prescribed by the University and have in all respects satisfied the conditions and requirements laid down or otherwise approved by the University.

03: To encourage and promote scholarship and to conduct research in scientific, technological, professional and other aspects of life;

04: To relate its activities to the technological, cultural, social and economic needs of the people of Nigeria;

05: To undertake any other activities appropriate to a University of the highest standard and such other activities as the University may decide in the furtherance of advancement of learning particularly the sciences, engineering and technology;

06: To promote research and development directed towards the production of goods and the improvement of technological services;

07: To disseminate scientific and technological knowledge among scientists, researchers, industries, trade services and other bodies which may benefit from such knowledge;

08: To promote the growth and development of scientific and technological applications in the national economy through association with outside persons or bodies and through centers specially set up by the University in that behalf;

09: To ensure that the subjects taught are oriented towards the immediate and long term needs of the country and that such subjects are also relevant to the needs of the Nigerian economy;

010: To establish industrial centres in order to promote the acquisition of industrial expertise and the exchange of skills between the University and industry

1.4.5 Programme Educational Objectives (PEOs) of Computer Engineering

Programme Educational Objectives (PEOs) of Computer Engineering in Enugu state university of science and technology published in the departmental handbook 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. Apart from this Vision, Mission, motto, aim, objectives, PEOs and POs are disseminated to all the stakeholders of the program through faculty meetings, student awareness workshops, student orientation program, placement and training activities and relevant social medias at regular intervals.

The PEOs include:

1. **PEO1**: 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 and understanding and applying discrete mathematics and computation;
2. **PEO2:** Analysing, designing and optimally managing the hardware/software computer system requirements of organisations with limited resources and solving complex engineering problems by collecting and analysing data as well as developing models and implementing solutions for engineering problems globally;
3. **PEO3:** Undertaking research, and laboratory and real-life and real-time experiments by using modern computer engineering models, tools, and information technologies to develop computer-based devices/systems
4. **PEO4:** 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 as well as appreciating and

5. **PEO5:** 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;
6. **PEO6:** Practising in different roles as engineering managers, project managers, innovators, entrepreneurs, quality controllers, researchers/knowledge creators and managers in the computer engineering field; and having an understanding of contemporary as well as legal and ethical issues impinging on computer engineering solutions deployed in society.

1.6 Programme Outcomes (POs)

1.6.1 POs as defined by COREN

PO1: Engineering Knowledge: apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of developmental and complex engineering problems;

PO2: Problem Analysis: Identify, formulate, research literature and analyze developmental and complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences;

PO3: Design/Development of Solutions: Proffer solutions for developmental or complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations;

PO4: Investigation: Conduct investigation into developmental or complex problems using research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;

PO5: Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and ICT tools, including prediction, modelling and optimization to developmental and complex engineering activities, with an understanding of the limitations

PO6: The Engineer and Society: Apply reasoning informed by contextual knowledge including humanities and social sciences to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice

PO7: Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice, including adherence to the COREN engineers' codes of conduct

PO9: Individual And Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings

PO10: Communication: Communicate effectively on developmental or complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;

PO11: Project Management: Demonstrate knowledge and understanding of engineering, management and financial principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments demonstrate knowledge and understanding of engineering, management;

PO12: Lifelong Learning: Recognize the need for, and have the preparations and ability to engage in independent and lifelong learning in the broadest context of technological and social changes.

1.6.2 Programme Outcomes (POs) of Computer Engineering

Programme Outcomes (POs) of Computer Engineering in Enugu state university of science and technology published in the departmental handbook and also are disseminated to all the stakeholders of the program through faculty meetings, student awareness workshops, student orientation program, placement and training activities and relevant social medias at regular intervals.

They include:

PO1: have adequate knowledge of computer engineering domain to become employable in Industry and ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

PO2: have strong fundamentals and problem solving skills to analyse, design and develop economically feasible solutions for technical and social problems

with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

PO3: be aware of recent research trends, higher education and entrepreneurial opportunities, and will work ethically towards society.

PO4: be aware about the latest technology in software and hardware.

PO5: be exposed to industrial training giving hands on experience.

PO6: develop an ability to identify, formulate, and solve complex computer related engineering problems

PO7: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

PO8: an ability to communicate effectively computer engineering knowledge with a range of audiences in tandem with applying engineering design to produce solutions that meet specified needs

PO9: have an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

1.7 PROGRAMMES OF THE DEPARTMENT

Computer Engineering offer:

(1) Undergraduate program (B.Eng) in Computer Engineering

(2) Postgraduate Programmes offered are:

a) Postgraduate Diploma (PGD)in Computer Engineering.

b) Postgraduate Diploma (PGD)in Information Communication Technology (ICT)

c) Master in Computer Engineering (M.Eng) in any of the following options;

- ✓ Computer Systems Architecture
- ✓ Computer Software & Firmware Engineering

- ✓ Intelligent Systems

d) Master in Information Communication Technology (ICT) (MSc)

e) Doctor of philosophy (PhD)in Computer Engineering in either of the following

- ✓ Intelligent Systems Engineering
- ✓ Software Engineering
- ✓ Instrumentation Engineering

f) Doctor of philosophy (PhD) in Information Communication Technology (ICT)

1.8 ADMISSION REQUIREMENTS

For admission through UMTE, all candidates must have O'Level five credit passes in English Language, Mathematics, Physics, Chemistry, and any other Science subject and must reach the UMTE cutoff mark as set by the university.

For direct entry admission requirement a candidate must have at least a National Diploma (ND) or Higher National Diploma (HND) Certificates with at least 3.5 (under a 5-point rating) CGPA in a relevant field Credit in English Language, Mathematics, Physics, Chemistry, and any other Science subject, this will make a candidate eligible for consideration for admission into 200 (ND) and 300 (HND) levels respectively.

1. **POSTGRADUATE DIPLOMA (PGD)**

a) PGD in Computer Engineering

- ✓ HND with minimum of upper credit in Computer/Electronic Engineering or relevant engineering field from a recognized polytechnic.
- ✓ B.Sc/B. Eng degree in Computer/Electronic Engineering or relevant engineering field with a minimum of third class degree from a recognized university.

b) PGD in ICT

- ✓ HND with minimum of upper credit in Computer Science or relevant science discipline from a recognized polytechnic.
- ✓ B.Sc degree in Computer Science or relevant science discipline with a minimum of third class degree from a recognized university.

2. **MASTER DEGREE PROGRAMME**

a) Master Degree (M.Eng) in Computer Engineering

- ✓ The entry requirement for master degree in Computer Engineering is at least a good second class degree with minimum Cumulative Grade Point Average (CGPA) of 3.00 on five point scale in Computer/Electronic Engineering or relevant engineeringfield from a recognized degree awarding institution. Such a candidate is expected to have obtained the minimum university entry requirements.
- ✓ HND holders in Computer/Electronic Engineering or relevant engineering field will be required to register for PGD in the first instance and on successful completion with minimum CGPA of 3.5 on five point scale may apply for the M.Eng degree programme.
- ✓ A candidate with an Upper Credit in the postgraduate diploma (PGD), in relevant engineering discipline, from a recognized University may also be admitted to a Master Degree programme provided the University Matriculation requirements are satisfied.

b) Master Degree (MSc) in ICT

- ✓ The entry requirement for master degree in ICT is at least a good second class degree with minimum CGPA of 3.00 on five point scale in Computer Science or relevant science field from a recognized degree awarding institution. Such a candidate is expected to have obtained the minimum university entry requirements.
- ✓ HND holders in Computer Science or relevant science field will be required to register for PGD in the first instance and on successful completion with minimum CGPA of 3.5 on five point scale may apply for the M.Eng degree programme.
- ✓ A candidate with an Upper Credit in the postgraduate diploma (PGD), in relevant science field, from a recognized University may also be admitted to a Master Degree programme provided the University Matriculation Entry (UME) requirements are satisfied.

3) DOCTOR OF PHILOSOPHY (PhD)

a) PhD in Computer Engineering

The entry requirement for Doctor of Philosophy in Computer Engineering will be at least a completed master degree programme with a minimum CGPA of 3.50 on a five point scale in Computer/Electronic Engineering or related engineering field, from any recognized university.

b) PhD in ICT

The entry requirement for Doctor of Philosophy in ICT will be at least a completed master degree programme with a minimum

CGPA of 3.50 on a five point scale in Computer Science or related science field, from any recognized university.

A) MANDATORY DURATION OF PROGRAMME

A uniform duration for the postgraduate programmes for all Universities, making allowance for minor individual university variation shall be adopted as follows: This may be undertaken on **Full-Time** or **Part-Time** basis.

I. Postgraduate Diploma programme

Full-Time: Minimum of four (4) semesters and a maximum of six (6) semesters.

Part-Time: Minimum of six (6) semesters and a maximum of eight (8) semesters.

II. Master's Degree Programme

Full-Time: Minimum of three (3) semesters and a maximum of six (6) semesters.

Part-Time: Minimum of four (4) semesters and a maximum of eight (8) semesters.

III. Doctor of Philosophy Programme

Full-Time: Minimum of four (4) semesters and a maximum of twelve (12) semesters.

Part-Time: Minimum of eight (8) semesters and a maximum of sixteen (16) semesters

1.9 COURSE OUTLINE & DESCRIPTION

Curriculum of the programme/sub-discipline/discipline Course contents specifications/syllabus of all courses in the Programme/Sub-Discipline/Discipline:

Undergraduate Program:

COURSE OUTLINE & DESCRIPTION

Curriculum of the programme /sub-discipline/discipline Course contents specifications/syllabus of all courses in the Programme/Sub-Discipline/Discipline:

00 LEVEL ***SEMESTER 1***

COURSE CODE	***COURSE TITLE***	***UNITS***	***STATUS***	***LH***	***PH***	***T***
GST 111	Communication In English I	2	C	30		
GST 113	Nigerian Peoples & Culture	2	R	30		
GST 121	Use Of Library, Study Skills & ICT	2	C	30		
MAT 111	Elementary Mathematics I	3	C	45		
PHY 111	General Physics I	3	C	45		
PHY 197	General Practical Physics I	1	C		30	
ICH111	General Chemistry I	3	C	45		
ICH 197	General Practical Chemistry I	1	C		30	
CEE 121	Computer Programming	3	R	45		
	TOTAL	**20**				

100 LEVEL SEMESTER 2

COURSE CODE	***COURSE TITLE***	***UNITS***	***STATUS***	***LH***	***PH***	***T***
GST 112	Communication In English II	2	C	30		
GST 114	Social Sciences	2	C	30		
GST 118	Peace Studies & Conflict Resolution	2		30		
MAT 112	Elementary Mathematics II	3	R	45		
PHY 112	General Physics II	3	R	45		
PHY 198	General Practical Physics II	1	R		30	
ICH 112	General Chemistry II	3	R	45		
ICH 198	General Practical Chemistry II	1	R		30	
MEC 122	Basic Engineering Drawing	2	C	30		
MME 122	Engineering Materials	3	R	45		
	TOTAL	**22**				

200 LEVEL SEMESTER 1

COURSE CODE	***COURSE TITLE***	***UNITS***	***STATUS***	***LH***	***PH***	***T***
CEE 221	Introduction to Modeling and Simulation	2	C			

EEE 221	Applied Electricity I	3	C			
MEC 223	Engineering Drawing I	2	C			
CHE 225	Fundamentals of Fluid Mechanics	3	C			
CVE 227	Applied Mechanics	3	C			
FEG 227	Engineering Mathematics I	3	R			
FEG 221	Engineer in Society	2	R			
FEG 293	General Engineering Laboratory Course	1	R			
	TOTAL	**19**				

200 LEVEL SEMESTER 2

COURSE CODE	***COURSE TITLE***	***UNITS***	***STATUS***	***LH***	***PH***	***T***
ENS 222	Introduction to Entrepreneurship	2	R			
EEE 222	Applied Electricity II	3	C			
MEC 224	Engineering Drawing II	2	C			
FEG 294	Student Work Experience Programme (SWEP)	1	C			
CHE 226	Fundamentals Of Thermodynamics	3	C			
CVE 228	Strength of Materials	3	C			
FEG 228	Engineering Mathematics II	3	R			
FEG 290	SIWES I	2	C			
	TOTAL	**19**				

300 LEVEL SEMESTER 1

COURSE CODE	***COURSE TITLE***	***Units***	***Status***	***L H***	***PH***	***T***
ENS 311	Entrepreneurship Practicum	2	R			
FEG 321	Engineering Mathematics III	3	R			
CEE 371	Digital Circuits	3	C			
CEE 333	Software Development Techniques I	2	C			
EEE 341	Electromagnetic Fields & Waves I	2	C			

EEE 343	Electrical Machines	2	C			
EEE 361	Circuit Theory I	2	C			
CEE 391	Laboratory Practical I	3	C			
	TOTAL	19				

300 LEVEL SEMESTER 2

COURSE CODE	***COURSE TITLE***	***Units***	***Status***	***LH***	***PH***	***T***
FEG 322	Engineering Mathematics IV	3	R			
EEE 332	Communication Principles	3	R			
CEE 334	Software Development Techniques II	2	C			
EEE 334	Analogue Electronic Devices & Circuits	3	C			
CEE 336	Operating Systems	2				
CEE 372	Instrumentation Engineering I	2	C			
FEG 390	SIWES II	3	C			
	TOTAL	**18**				

400 LEVEL SEMESTER 1

COURSE CODE	***COURSE TITLE***	***Units***	***Status***	***LH***	***PH***	***T***
CEE 431	Assembly Language Programming	3	R			
CEE 433	Database Design	2	C			
CEE 445	Computer Architecture	2	C			
CEE 451	Digital Computer Networks	3	C			
CEE 461	Introduction to Microprocessors	2	C			
CEE 471	Control Systems	3	R			
CEE 491	Laboratory Practical II	2	C			
CEE 493	Circuit Implementation & Prototyping Techniques	2	R			
	TOTAL	**19**				

400 LEVEL SEMESTER 2

COURSE CODE	***COURSE TITLE***	***Units***	***Status***	***LH***	***PH***	***T***
FEG 490	SIWES III	6	C			
	TOTAL	**6**				

500 LEVEL SEMESTER 1

COURSE CODE	*COURSE TITLE*	*Units*	*Status*	*LH*	*PH*	*T*
CEE 531	Cyberpreneurship & Cyber Law	2	C			
CEE 553	Computer Security Techniques I	2	C			
CEE 565	Digital Signal Processing	3	C			
CEE 573	Microprocessor Based Real-time Systems	2				
CEE 575	Digital Systems Design With VHDL	3	C			
CEE 583	Artificial Intelligence	3				
CEE 597	Technical Communication In Computer Engineering	1				
	Electives	2	E			
CEE 535	Web Design					
CEE 555	Design & Installation Of Electrical & ICT Services					
CEE 585	Fuzzy Logic & Programming					
	TOTAL	18				

500 LEVEL SEMESTER 2

COURSE CODE	***COURSE TITLE***	***Units***	***Status***	***L H***	***PH***	***T***
CEE 572	Instrumentation Engineering II	2	C			
CEE 534	Computer Graphics & Animation	3	C			
CEE 536	Software Engineering	3	C			
CEE 556	Reliability & Maintainability	2	C			
CEE 574	Embedded System Design	2	C			
CEE 599	Project	6	C			
	Electives	2	E			
CEE 554	Computer Security Techniques II					
CEE 568	Digital Image Processing					
CEE 576	Robotics & Automation					
	TOTAL	**20**				

GST 111: Communication in English 1
First Semester, 2 Units

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 (brainstorming and 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

Effective communication and writing in English, Language skills, Writing of essay answers, Comprehension, Sentence construction, Outline and paragraphs, Collection and organization of materials and logical presentation, Punctuation.

Course 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.

GST 113: Nigeria Peoples and Culture

First Semester, 2 Units

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.

Course Learning Outcomes

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

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

GST 121: Use of Library, Study Skills and Information Technology (ICT) First Semester, 2 Units

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

Course Learning Outcomes

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

1. explain brief history of libraries, Library and education, University libraries and other types of Libraries, Study skills (reference services),
2. list types of library materials, using library resources including e-learning, e-materials, etc. understanding library catalogues (card, OPAC,

etc.) and classification,

3. Classify copyright and its implications, Database resources, Bibliographic citations and referencing.
4. construct simple and fairly complex sentences in English;
5. Apply modern ICT, Hardware technology and Software technology: Input devices, Storage devices, Output devices, Communication and internet services, Word processing skills (typing etc.)

MAT 111: Elementary Mathematics I
First Semester, 3 Units

Number systems. Elemental set theory. The algebra of real numbers: surds, indices, logarithms and quadratic equations; polynomials and their factorization; the Remainder and Factor Theorems; rational functions and partial fractions; permutations and combinations; the Binomial Theorem; solution of inequalities; sequences and series; the principle of mathematical induction. The algebra of complex numbers; addition, subtraction, multiplication and division; Argand diagrams and the geometry of complex number; modulus, argument and polar coordinates; Euler's theorem; deMoivre Theorem; solution of equations of the form: $\mathbf{Z^n = C.}$ Elementary properties of the trigonometric functions, including periodicity of these circular functions; radian measure and its applications; addition formulae and other basic identities; the sine and cosine laws; solution of triangles; heights and distances; inverse trigonometric functions and solution of trigonometric equations.

Course 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.

PHY 111: General Physics I
First Semester, 3 Units

Units; dimensional analysis; vectors; equilibrium; moment of a force; torque; couples; centre of gravity. Rectilinear motion; Newton's Laws of motion in a plane; projectile motion; linear and angular momentum. Rotation of a rigid body. Work, energy and power. Electricity, Viscosity, and Surface tension. Pressure and hydrostatics. Travelling waves, Stationary waves. Longitudinal and Transverse waves. Sound waves. Temperature and heat. Transfer of heat. Gases, liquids and adiabatic processes. Internal Energy. Mechanical equivalent of heat.

Course 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 simp
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.

PHY 197: General Practical Physics I

First Semester, 1Unit

At least six experiments from the following use of measuring instruments, viscosity, surface tension, oscillation about an equilibrium position, Hooke's law, moment of inertia, Focal length of lenses, refractive index, optical instruments, the sonometer, heat capacity, volume expansion and latent heat.

Course 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.

ICH 111:General Chemistry I

First Semester, 3 Units

Section A -- Inorganic

Atomic structure; electronic configuration of the elements; electronic theory of valence. The periodic classification of the elements and periodicity. Chemical bondage: valence force; shapes and structures of chemical substances. General study of hydrogen, nitrogen, oxygen, phosphorus, sulphur, chlorine, bromine, iodine, sodium, calcium, aluminium, iron, manganese, copper and zinc with emphasis on similarities and differences based on position of elements in the periodic table. Isotopes. Introduction to radioactivity and applications in chemistry.

Section B -- Organic

IUPAC nomenclature and classes of compounds; elemental analysis, molecular formula and the determination of structures of organic compounds .Structural isomerism. Isolation and purification methods. The concepts of functional groups, resonance and aromaticity. Study of the structures and reactions of saturated and unsaturated hydrocarbons, alcohols, alkyl halides, ether, aldehydes and ketones, carboxylic acids, amines. Introduction to the concept of stereochemistry.

Course Learning Outcomes

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

1. Define atom, molecules and chemical reactions;
2. Discuss the modern electronic theory of atoms;
3. Write electronic configurations of elements on the periodic table;
4. Rationalise the trends of atomic radii, ionisation energies, electronegativity of the elements, based on their position in the periodic table;
5. Identify and balance oxidation–reduction equation and solve redox titration problems;
6. Draw shapes of simple molecules and hybridised orbitals;
7. Identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. Apply the principles of equilibrium to aqueous systems using le-chatelier'sprin predict the effect of concentration, pressure and temperature changes on equilibrium Mixtures;
9. Analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. Determine rates of reactions and its dependence on concentration, time and temperature.

ICH 197: General Practical Chemistry I

First Semester, 1 Unit

Theory and practice of qualitative chemical analysis, calculation, data analysis and presentation, Acid-base, oxidation-reduction reactions, precipitation and complex o metric titrations, Gravimetric analysis.

Course Learning Outcomes

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

1. State the general laboratory rules and safety procedures;
2. Collect scientific data and correct carry out chemical experiments;
3. Identify the basic glassware and equipment in the laboratory;
4. State the differences between primary and secondary standards;
5. Perform redox titration;
6. Record observations and measurements in the laboratory notebooks; and

7. Analyse the data to arrive at scientific conclusions.

CEE 121: Computer Programming
First Semester, 3 Units

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.

Course Learning Outcomes
At the end of this course, the students should be able to:
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. Recognize human, security, social, and entrepreneurial issues and responsibilities relevant to engineering software and the digitalization 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.

GST 112: Communication in English II
Second Semester, 2 Units
Logical presentation of papers, Phonetics, Instruction on lexis, Art of public speaking and oral communication, Figures of speech, Précis, Report writing.

GST 114: Social Sciences
Second Semester, 2 Units

Classification of social systems; inter-personal relationships; Personality traits and leadership qualities; The role of the media; meaning, scope and indices of development; historical perspectives, ideological bases, economic, political and social factors of developments; self-reliance and National Development; Growth and spatial distribution of population; delivery of public goods through public enterprises and agencies; peaceful co-existence among nations; the concept of human rights. Types, causes, and effects of strikes in Nigeria; religion in society in the third millennium; and capitalism socialism; an overview.

GST 118: Peace Studies and Conflict Resolution
Second Semester,2 Units

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

MAT 112: Elementary Mathematics II
Second Semester, 3 Units

Functions: Concept and notation. Examples from polynomials, rational, exponentials, logarithmic and trigonometric functions. Graphical representation of functions and properties of graphs; plane analytic geometry; equation of the straight line, the circle, the ellipse, the parabola and the hyperbola. Differentiation of functions of a single variable form first principles. Techniques of differentiation formulae for sums, products, quotients and the chains rule. Differentiation of implicit functions, Higher order derivatives and partial differentiation. Applications of the derivative to extremum and simple rate problems. L'Hopital's rule for the evaluation of limits. The Taylor and Maclaurin series. The anti-derivative. The definite integral and the Fundamental Theorem of the integral calculus. Techniques of integration. Improper integrals. Applications.

PHY 112: General Physics II
Second Semester, 3 Units

Reflection and refraction. Transmission and absorption of light. Dispersion Optical instrument lens aberrations Wave nature of light. Electromagnetic waves. Huygens's

principle. Inference. Diffraction and polarization Quantum nature of the light. The photon. Electrostatics, Magneto statics. A.C. current measuring instruments. Electrochemistry and cells. Thermo-electricity. Magnetic field due to a current. Force on a current in magnetic field. Faraday's law. Alternating currents. Transformers, Rectification, structure of matter. Isotopes. Bohr's atomic theory, and elementary atomic spectra. X-rays. Measurement of e and e/m of charges. The nucleus. Natural and artificial radioactivity. Radiation detection.

PHY 198: General Practical Physics II
Second Semester, 1 Unit
At least six experiments from the following: potential difference and internal resistance of cells, use of potentiometer circuit, the meter bridge, simple current measuring instruments, Planck's constants and radioactivity.

ICH 112:General Chemistry II
Second Semester, 3 Units
Gas laws. Postulates of the molecular kinetic theory of gases. Equation of state of an ideal gas. Real gases behavior, law of corresponding states, interaction of gases study of dilute solutions, colligative properties. Thermo chemistry, chemical equilibrium, law of mass action; chemical energetics, Electrolytes and ionic
equilibrium; theory of acids, bases and indicators. Phase equilibrium; study of single component systems.
ICH 112:General Practical Chemistry II

Second Semester, 1 Unit
Qualitative inorganic and organic analysis for element in Group IA, IIA,IIIA, IVA,IB,IIB,IIIB. Chemical analysis for functional groups: acidic, Ketonic, carboxylic, etc.

MEC 122: Basic Engineering Drawing
Second Semester, 2 Units

Use and care of drawing instruments and equipment- drawing board, T-square, set-square, drawing set, pencils, etc. Elementary use of instruments setting paper on board; drawing horizontal, vertical and inclined lines, using instruments; drawing of parallel lines. Lettering. Drawing border line and title blocks. construction - bisection of lines and angles. Erection of perpendicular at a point on a line. Dropping a perpendicular from a point outside a line. Dividing a line into a given report. Copying and construction of angles. Construction of triangles, rectangles and squares.: drawing a circle to pass through three given points; determining the center of a given circular arc. Drawing tangent from a point to a

circle. Drawing internal and external tangents to two circles. General tangency problems. Circumscribed and inscribed circles. Construction of polygons: pentagons, hexagons, octagons.
General method given length of side: ellipse, parabola, hyperbola, cycloid, involute, etc. Introduction to orthographic projection (1st and 3rd angle) using simple objects.

MME 122:Engineering Materials
Second Semester, 2 Units
Introduction to electronics configuration, atomic structures, interatomic bonding mechanisms, crystal and microstructure. Relationship between structure and properties of metals, alloys, ceramics and plastics. Principles of behavior of materials in common environments. Fabrication processes and applications.

200 LEVEL

CEE 221: Introduction to Modeling and Simulation
First Semester, 2 Units
This is the introductory course for the modeling and simulation (M&S). The course presents an introduction to the theory and practice of modeling and simulation. Introduction to modeling, modeling concepts and definitions, introduction to MATLAB, MATLAB scripts, MATLAB arrays, linear models, graphing data in MATLAB, MATLAB array math, advanced graphing in MATLAB, nonlinear functions, nonlinear modeling examples, curve fitting, MATLAB programming assignments, MATLAB I/O, stochastic models, project plan, overview and requirements, accuracy and precision in modeling, MATLAB conditional statements, MATLAB loops, MATLAB functions. Use of simulation tools link Simulink. 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, tests hypothesis and significance. Regression and correlation.

Learning Outcomes
Students should be able to:
1. Demonstrate the fundamental concepts and principles of modeling and simulation
2. Apply mastery of use of MATLAB
4. Develop skills in MATLAB scripts, MATLAB arrays, linear models, graphing data in MATLAB, MATLAB array math, advanced graphing in MATLAB, nonlinear functions, nonlinear modeling examples, curve fitting

5. Analyze and optimize designs using simulation tools link Simulink..
7. Optimize and recognize/understand the practical link to excite their creativity
8. Perform and institute a concept in modeling and simulation for creative innovation.

EEE 221: Applied Electricity I
First Semester, 3 Units

Introduction of Concepts: Electrons and protons, conductors, insulators and semiconductors, SI units and definitions of the ampere, the volt, resistance, power and energy.
Resistive Networks: Conductance and resistivity. Temperature coefficient of resistance. Resistor color codes. Resistances in series and parallel connections. Ohms's law for a resistive network. Open and short circuits. Cells. Kirchhoff's current and voltage law. Electrostatics; Magnets and magnetic materials. Magnetic fields, permeability, magnetomotive force.
Magnetic Circuits: Ohm's law for magnetic circuits. Reluctance and performance.
Series and parallel connected magnetic circuits. Magnetic leakage. Hysteresis loss; magnetic coupling and screening.
Introduction to AC Theory: Waveform generation. Angular measure, frequency and period. Average and r.m.s. values. Phasers and phase angle. Reactance and susceptance.
Analysis of AC Circuits: Ohm's law for an AC circuit, series and parallel RLC circuits. Power and energy in AC circuits. Resonance. Harmonics. Kirchhoff's laws.

Nodal and mesh Analysis of AC networks.
Circuit Transients: Transients on RC and RI circuits. Network Theorems: Superposition theorem, Thevenin's and Norton's theorems. Maximum power transfer in AC networks.
Faraday's laws and Lonz's laws: Application of Faraday's law to the analysis and performance of a single-phase transformer.
Course Learning Outcomes (CLO): Upon successful completion of the course, students will be able to:
1. Employ simple lumped circuit models for resistors, sources, inductors, capacitors, and transistors in circuits.
2. Analyze circuits made up of linear lumped elements. Specifically, circuits containing resistors and independent sources using techniques such as the node method, superposition and the Thevenin method
3. Calculate the frequency response of circuits containing resistors, capacitors and inductors.

4. Calculate the time behavior of first order and second order circuits containing resistors, capacitors and inductors
5. Carry out a small-signal analysis of an amplifier using small signal models for the circuit elements.

MEC 223: Engineering Drawing I
First Semester, 2 Units

Use and care of drawing instruments and equipment- drawing board, T-square, set-square, drawing set, pencils, etc. Elementary use of instruments setting paper on board; drawing horizontal, vertical and inclined lines, using instruments; drawing of parallel lines. Lettering. Drawing border line and title blocks. construction - bisection of lines and angles. Erection of perpendicular at a point on a line. Dropping a perpendicular from a point outside a line. Dividing a line into a given report. Copying and construction of angles. Construction of triangles, rectangles and squares.: drawing a circle to pass through three given points; determining the center of a given circular arc. Drawing tangent from a point to a circle. Drawing internal and external tangents to two circles. General tangency problems. Circumscribed and inscribed circles. Construction of polygons: pentagons, hexagons, octagons. General method given length of side.: ellipse, parabola, hyperbola, cycloid, involute, etc. Introduction to orthographic projection (1st and 3rd angle) using simple objects.

CHE 225: Fundamentals of Fluid Mechanics
First Semester, 3Units
Properties of fluids, Fluid statics. Basic conservation laws. Friction effects and losses in laminar and turbulent flows in pipes. Dimensional analysis and dynamic similitude. Principles of construction and operation of selected hydraulic machinery. Hydropower systems.

CVE 227: Applied Mechanics
First Semester, 3 Units
Coordinate systems and position vectors; kinematics of a particle in plane motion in different coordinates; displacement, velocity and acceleration of a particle;
kinetics of a particle in plane motion; Newton's laws; types of forces; systems of particles; center of mass; simple harmonic motion; impulse and momentum kinematics of a rigid body in plane motion; types of motion; relative motion between two points on a rigid body; velocity diagrams; instantaneous center of rotation; kinetics of rigid in plane motion; work and energy for a system of

particles kinetic energy of rigid body; potential energy; general energy principles; virtual works; D'Alembart's principle

FEG 227: Engineering Mathematics I
First Semester, 3 Units
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

FEG 221: Engineer in Society
First Semester, 2Unit
Philosophy of Science and Engineering. History of Engineering and Technology. The Engineering profession – engineering professional bodies and engineering societies. Engineers code of conduct and ethics. Engineers and nation building - economy. politics, business, safety in engineering and introduction to Risk analysis, invited lectures from professionals.

FEG 293: General Engineering Laboratory
First Semester, 1 Unit
Laboratory investigation and report submission for selected experiments and project in Engineering Mechanics I, Fundamentals of Electrical Engineering I and Fundamentals of Fluid Mechanics.

ENS 222: Introduction to Entrepreneurship I
Second Semester, 2 Units
Concepts of Entrepreneurship, Entrepreneur, and Entrepreneurship Skills. Development of Entrepreneurship and Intrapreneurship, Nigerian Entrepreneurship Environment, Rationale for Entrepreneurship, Enterprising and Entrepreneurial Attitude/Behavior, Leadership and Entrepreneurial Skills for coping with challenges, Creativity and Innovation for Entrepreneurs. Concepts of Business and New Value Creation, Business Growth. An overview: Sources of funds in Entrepreneurship, Financing New Ventures; Marketing and Product Pricing in Entrepreneurship: Budgeting in Entrepreneurship, Communication and Public Relations in Entrepreneurship, Management in Entrepreneurship, e-business and Entrepreneurship, Forms of Businesses Staffing, Feasibility Studies, Capital requirements; and Raising Capital: Financial Planning; Legal Issues; Insurance and Environmental Conditions. Business Opportunities and Job Creation Challenges; Risks; Ethics and Rewards of Entrepreneurship; Business/Product Registration; Business Failure; Family Business and Succession Planning; Women and Social Entrepreneurship.

Course 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 state the basic principles of e-commerce

EEE 222: Applied Electricity II
Second Semester, 3 Units

Analysis of 3-phase circuits: Star and delta connection. Measurement of power by 2-wattmeter and 3-wattmeter methods. Power factor correction. Coupled circuits. Basic principles of Electric Machines: Synchronous generator, induction motors and d.c. machines. Introduction to Electronics: Semiconductor properties; electrons
and holes. Intrinsic and extrinsic conduction. Simple treatment of donor and acceptor atoms. P-N junctions. Characteristics of vacuum tubes: diodes, triodes, pentodes, etc. Measurement and Instrumentation: Cathode Ray tube. Use of meters: Ammeters, Voltmeters, AVO meters, C.R.O. and signal generators, Circuits symbols. Component identification. Potentiometer and Wheatstone bridge.

MEC 224: Engineering Drawing II
Second Semester, 2 Units

Further work on orthographic projection including prism, pyramid and cone in normal and inclined planes. Sectional views, conic sections and true shapes Isometric and oblique projections. Dimensioning. Development of surfaces; parallel and radial line methods. Introductory building drawing; common sizes of brick and cement blocks. Brick/block bonds. Representation of doors and windows in plan. Wall plate, rafters, etc. Electrical circuit diagrams, Bolts and nuts. Freehand sketching.

FEG 294: Student Work Experience Programme (SWEP)
Second Semester, 1 Unit

Practice and skills in general engineering through instruction in operation of hand and powered tools for wood and metal cutting and fabrication. Supervised hand on experience in safe usage of tools and machine for selected tasks. General practices on automobile repairs, survey, civil, electrical and other related engineering practice.

CHE 226: Fundamentals of Thermodynamics
Second Semester, 3 Units
Definitions of systems, properties and reversibility. The ideal gas. Heat and work. The First Law for a closed system. The law for a steady-state, reversible, isobaric, isothermal, adiabatic and polytropic processes. equations of the state pure fluids, the viral equation of state, generalized correlation. The steady state flow equation (Bernouilli's Equation) and applications. The Second Law, the heat engine, entropy, irreversibility, the Third Law. Thermodynamic properties of fluids.

CVE 228: Strength of Materials
Second Semester, 3 Units
Fundamental hypotheses in strength of materials; problems and methods in strength of materials; external and internal forces, stresses displacements and deformations; Hooke's law and the principles of superpositions; general principles of structural analysis; tension and compression; internal forces and stresses on cross-section of a bar and Hooke's law; potential energy of strain; pure shear and its characteristics; torsion of a rod of circular and non-circular cross section; geometrical character of a section; moments and principal moments of inertia of a section; stresses in transverse and oblique bending.

FEG 228: Engineering Mathematics II
Second Semester, 3 Units
Second order differential equations, line integral, multiple integral, and their applications, differential of integral. Analytical functions of complex variables. Transformation and mapping, special functions.

FEG 290: SIWES I
Second Semester, 2 Units
On the job experience in the industry.
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 specializations;
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.

300 LEVEL

ENS 311: Entrepreneurship Practicum
First Semester, 2 Units

Introduction to entrepreneurship and new venture creation; Entrepreneurship in theory and practice; Determining capital requirement, Raising capital; Financial planning and management; Starting a new business, Feasibility studies; Innovation;

Legal issues; Issuance and environmental considerations. Possible business opportunities in Nigeria. Some of the ventures to be focused upon include the following: Soap/Detergent, Tooth brushes and Tooth paste making, Photography, Brick, nails, screws making, Dyeing/Textile block paste making, Rope making, Plumbing, Vulcanizing, Brewing, Paper production, Water treatment/Conditioning/Packaging, Food processing/packaging/preservation, Metal working/Fabrication – Steel and aluminum doors and windows, Training industry, Vegetable oil and salt extractions, Fisheries/Aquaculture, Refrigeration/Air conditioning , Plastic making, Framing (crop), Domestic Electrical wiring, Radio/TV repairs, Carving, Weaving, Brick laying/making, Bakery, Tailoring, Iron welding, Building drawing, Carpentry, Leather tanning, Interior decoration, Printing, Animal husbandry (Poultry, Piggery, Goat etc), Metal Craft- Blacksmith, Tinsmith etc. , Sanitary wares, Vehicle maintenance, Bookkeeping, Glassware production/Ceramic production.

FEG 321: Engineering Mathematics III
First Semester, 3 Units

Numerical analysis and its application to engineering problems. Operational methods, transform, series and special functions in engineering. Laplace transforms of common functions. Inverse transforms. Solution of differential and simultaneous equations. Periodic and Heaviside unit step functions. Direct delta impulse function. Examples from electrical and mechanical system. Fourier series and analysis. Dirichlet conditions. Numerical harmonic analysis, twelve point analysis. Double and triple integrals, line integral, closed curves, parametric equations. Volume integral. Jacobian transformation. Numerical solution of equations the Newton-Raphson iterative method. Numerical solution of differential equations, Euler method and the Runge-Kutta techniques. Interaction for eigen values and eigenvectors. Interactive methods for solving a system of linear equations, Jacob, Gauss-Seidel and Relaxation techniques.

Course 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.

CEE 371: Digital Circuits
First Semester, 3 Units

Introduction to analysis and design of digital systems. Boolean algebra and mapping methods; Karnaugh and variable entered maps, combinational logic realization with gates, multiplexers, Read Only Memories (ROMs) and Programmable Logic Arrays (PLAs).Introduction to analysis and design of digital systems. Boolean algebra and mapping methods; Karnaugh and variable entered maps, combinational logic realization with gates, multiplexers, Read Only Memories (ROMs) and Programmable Logic Arrays (PLAs).

Course Learning Outcomes:

Students will be able to:

1. State the operations in Boolean algebra;
2. Write Boolean expressions in POS and SOP forms;
3. Minimize logic expressions using Karnaugh maps and Quine-McCluskey method;
4. Explain the functions, characteristics and operations of basic logic gates;
5 name and state the characteristics of, at least, two logic families;
5. Implement logic expressions using logic gates;
6. Define and differentiate between combinational and sequential circuits;
7. Describe the types, functions, characteristics, operations of flip-flops, counters, multivibrators, registers;
8. Design simple combinational and sequential circuits using logic gates, flip-flops, counters, multivibrators, registers.

EEE 341: Electromagnetic Fields and Waves I
First Semester, 2 Units

Review of electromagnetic laws in integral form, Gauss's Law, Ampere's and Faraday's Laws; Electrostatic fields due to distribution of charge, magnetic fields in and around current carrying conductors, time-varying magnetic and electric fields; conduction and displacement current; Maxwell's equation (in

rectangular co-ordinates and vector-calculus notation): Derivation of Maxwell's equations; electromagnetic potential and waves; Poynting vector; Boundary conditions; wave propagation in good conductors, skin effect; plane waves in unbounded dielectric media, Fundamentals of transmission lines, wave-guides and antennae.

Course Learning Outcomes:

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

1. Students will enhance their skills in manipulating and analyzing vectors in the context of electromagnetic fields.
2. Students will learn and apply electromagnetic laws, such as Gauss's law and Ampere's law, to analyze electric and magnetic fields.
3. Students will study magnetic fields in and around current-carrying conductors, using principles like the Biot-Savart law and Ampere's law.
4. Students will explore the behavior of electromagnetic fields with time-varying phenomena and understand Maxwell's equations.
5. Students will learn about the Poynting vector, which represents the direction and magnitude of electromagnetic power flow, and gain insights into energy transmission and distribution

EEE 343: Electrical Machines

First Semester, 3 Units

Review of electromechanical energy conversion, rotating magnetic fields, performance and methods of speed control of DC machines, induction motors, linear induction motors, circle diagrams, power transformers, and parallel operation of 3-phase transformers. Performance of synchronous machines, parallel operation of synchronous generators, fractional horse power motors, single-phase induction motors, universal motors. Reluctance motors, hysteresis motors. Faults on machines, methods of starting and protection of machines.

Course Learning Outcomes:

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

1. Understand the principles of electromechanical devices.
2. Analyze the behavior and performance of electromechanical systems.
3. Apply mathematical modeling and analysis techniques.
4. Design and optimize electromechanical systems.
5. Develop skills in troubleshooting and diagnosing electromechanical faults.

EEE 313: Circuit Theory

First Semester, 3 Units

Review of electrical quantities: Charge, voltage, current, power, energy. Voltage and current sources, resistor, inductor, capacitor. Ohm's Law, Kirchoff's current and voltage Laws: Thevenin and Norton equivalents, superposition, reciprocity, maximum power transfer theorem. Signal waveforms: D.C step, impulse, square

pulse, sinusoidal, triangular, and exponential. General description of signals, time constant, RMS values, duty cycle, crest factor, form factor. Effective alternating current. A.C behavior. Admittance and their real imaginary parts. Resonance: series and parallel resonance, half power point, bandwidth, Q-factors. Power: instantaneous, average, factor, active, reactive, complex, apparent. Analysis of first order LR and RC circuits subjected to excitation of DC, square pulse, sinusoidal sources and exponential sources. Interpretation of complementary function and particular integral. Elementary network topology, network constraints, network equilibrium equations. Nodal and mesh network analysis. L-attenuation network. Impedance transformation, constant impedance inverters, Norton's network transformation. Bartlett bisection theorem.

Course Learning Outcomes:

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

1. Analytical Skills: Students will learn to analyze circuits using Kirchhoff's Laws and solve problems in steady-state and transient states. They will study network responses to different input signals.
2. Mathematical Modeling: Students will use Laplace transforms to mathematically model circuits and understand their behavior in both time and frequency domains.
3. Circuit Synthesis and Analysis: Students will learn advanced analysis techniques like pole-zero analysis, network synthesis, and resonance. They will also study ladder networks and the Star-Delta transformation method to simplify complex circuits.
4. Theorems and Principles: Students will understand important theorems such as Superposition, Reciprocity, Thevenin's, Norton's, and Maximum Power Transfer theorems, which will aid in simplifying circuit analysis and optimizing performance.
5. Practical Application: Students will apply Circuit Theory knowledge to real-world scenarios, designing and analyzing practical circuits. This enhances problem-solving skills and prepares students for electrical engineering careers.

CEE 391: Laboratory Practical I
First Semester, 3 Units

Electrical Machines Laboratory

a) Laboratory work on electrical machines designed to illustrate topics covered in Electromechanical Devices and Machines.

b) Digital Electronics Laboratory

A laboratory work on digital electronics designed to illustrate topics covered in Electronic circuits.

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

(1) Illustrate hands-on, on the basic steps in software development and maintenance.

(2) Demonstrate writing codes and their executor for simple applications

(3) Write and execute codes for simple programming problems Testing and debug codes written for applications.

(4) Test and debug codes written for applications;

(5) Describe and demonstrate code reusability and software implementation.

(6) Develop simple software applications from scratch;

FEG 322: Engineering Mathematics IV
Second Semester, 3 Units

Mathematical modeling of physical systems, numerical techniques, boundary value problems, Fourier integral, Fourier series, orthogonal functions and Sturm-Liouville systems. Partial differential equations including theory, classification and solution by various methods.

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

1. Solve Second Order Differential Equations;
2. Solve Partial Differential Equations;
3. Solve Linear Integral Equations;
4. Relate Integral Transforms To Solution Of Differential And Integral Equations;
5. Explain And Apply Interpolation Formulas; And
6. Apply Runge-Kutta and other similar methods in solving ODE and PDEs.

EEE 332: Communication Principles
Second Semester, 3 Units
Amplitude modulation; double sideband, single sideband, and vestigial sideband modulation schemes; simple modulators, power and bandwidth performance. Angle modulation: frequency modulation, phase modulation, bandwidth requirements, clippers and limiters. Amplitude modulated signal reception: discrimination, frequency tracking loop, phase locked loop and noise performance. Commercial channels; construction of cables and fibers, sampling theorem, pulse amplitude modulation, pulse width modulation, multiplexing, quantization systems and pulse code modulation, delta modulation, courses and correction of errors in PCM and DM, ideal and matched filters, frequency acquisition, phase referencing and timing. Line codes, block encoding and Shannon's theorem.

Course Learning Outcomes:

1. Understand and apply communication principles in engineering, including message encoding, decoding, effective listening, and non-verbal communication.
2. Develop clear and concise oral communication skills for engineering presentations, including organizing information, using visual aids, and adapting to diverse audiences.
3. Enhance written communication skills for technical documents in engineering, such as reports, proposals, and memos, focusing on coherence, structure, and professionalism.
4. Cultivate teamwork and interpersonal communication skills for successful collaboration in engineering projects, including conflict resolution, active listening, feedback, and effective group discussions.
5. Analyze and evaluate communication practices in engineering, considering ethics, cultural diversity, and the impact of communication technologies. Identify barriers and propose improvements to enhance communication effectiveness.

CEE 334 Software Development Techniques II Second Semester, 3 Units

Software development life cycle. Top-Down design. Program design using pseudo-code, flowchart. Flowchart ANSI symbols and usage. Extensive examples, and exercises using pseudo-code/flowchart to solve practical problems in engineering. Debugging and documentation techniques. Programming using a structured language such as C: Symbols, keywords, identifiers, data types, operators, various statements, operator precedence, type conversion, conditional and control structures, function, recursive functions. Arrays: 1-D, and multi-dimensional arrays, passing elements or whole array to a function. Simple sorting and searching on arrays, pointers, strings, dynamic memory allocation. Structures and Unions: Structure declaration and definition, accessing structures, array of structures, pointers and structures, union declaration, enumerated variables. File handling: Concept of a file, files and streams, standard file handling functions, binary files and random access files. Advanced Topics: Command line parameters, pointers to functions, creation of header files, Stacks, linked lists, bitwise manipulation. Software development in C in MS windows, UNIX/LINUX environments, header file, pre-processor directives, make, make file. Static and dynamic linking libraries. Extensive examples, and exercises programming in C to solve practical problems in engineering. Exercises are to be done in the computer laboratory.

Course learning outcome

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

1. Use structures or Union to create file records.
2. Write C programs that access the content of files for processing.
3. Design data structures for use in digital control systems.
4. Use the C bitwise operators to manipulate devices
5. Design and implement an interface for a device connected to a PC port using C language

EEE 334 Analogue Electronic Devices & Circuits
Second Semester, 3 Units
Review of single-stage transistor amplifiers using BJTS and EETs Equivalent circuit and calculation of current gain, voltage gain, power gain, input and output impedance. Operational Amplifiers: Parameters and applications. Feedback, Broadband and narrowband amplifiers. Power amplifiers. Voltage and current stabilizing circuit. Voltage amplifiers, multi storage amplifier. Using BJTs and FETs.

Course 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. Analyze Output In Different Operating Modes Of Different Semiconductor Devices.

CEE 336 Operating System Second Semester, 2 Units
Computer Fundamentals: Development history of computer hardware and software. Hardwired vs. stored program concept. Von- Newman architecture. Harvard architecture: principle of operation, advantages, disadvantages Single address machine. Contemporary computers. Computer system: block diagram, functions, examples, dataflow, control line. Computer Arithmetic: integer arithmetic (addition, subtraction, multiplication, division), floating-point representation (IEEE), floating-point arithmetic, Arithmetic and Logic unit (ALU). Introduction to RISC and CISC architecture: principle of operation, merit, demerits. Storage and Input/output Systems: Computer function (fetch and execute cycles), interrupts, interconnection structures (Bus structure and bus types), Overview of memory system, memory chip organization, and error correction, cache memory, memory storage devices. Overview of I/O, programmed and

interrupt –driven I/Os, DMA, I/O channel and I/O processor. Control Unit: Micro-operations, control of the CPU, hardwired implementation, control unit operation, micro-instruction sequencing and execution, micro-programmed control. INTEL family, and MOTOROLA family as case study of a CISC computer system. Instruction set and Register: Machine instruction characteristics, types of operands and operations, instruction functions, addressing modes, instruction formats, register organization, instruction pipelining, storage hierarchy, units with function dedicated for I/O. RISC, introduction to superscalar processor, parallel processor. Use popular RISC processor (e.g. i960, Motorola PowerPC) as case study. Operating System: Overview of operating system, dimension and type of operating system, high level scheduling, memory management, virtual memory, UNIX/LINUX operating system: architecture, commands, programming; window based operating systems (MS windows, XP- window).

Course Learning Outcomes

At the end of the study, the student should be able to:
1. Characterize early operating systems, simple batch systems, multi-programmed and batched systems, time-sharing systems;
2. Describe computer system structures, computer system operation, i/o structures, computer storage structures and hierarchy;
3. Explain general system architecture and operating system structures;
4. Describe operating system components, operating system services, system calls, system programs, system structure, virtual machines, system design and Implementation, system generation;
5. Describe type conversion, conditional and control structures, function, recursive functions;
6. explain deadlock characterization, methods for handling Deadlocks - prevention, avoidance, detection, recovery, combined approaches, memory address space and management, paging, segmentation, virtual memory;
7 describe file systems, structures, management, implementation, recovery, and MS Windows and UNIX/LINUX architecture, applications, and programming.

CEE 372: Instrumentation Engineering I
Second Semester, 2 Units
General instrumentation, Basic meter in DC measurement, Basic meter in AC measurements, rectifier voltmeter, electro-dynamometer and wattmeter, instrument transformers, DC and AC bridges and their applications, general form of AC bridge, universal impedance bridge, Electronic instrument of voltage, current, resistance, and other circuit parameters, electronic voltmeters, AC

voltmeters using rectifiers, electronic millimeter, digital voltmeters, oscilloscope: vertical deflection system, horizontal deflection system, probes, sampling CRO, Instruments for generating and analyzing wave forms, square-wave and pulse generator, signal generators, function generators, wave analysers, Electronic executers and their applications: Time base circuitry, universal counter measurement modes: Analogue and digital data acquisition systems: D/A and A/D conversions, sample and hold circuits.

Course Learning Outcome
At the end of the course the student should be able to:

1. Explain the features of the basic meters for DC and AC measurements;
2. Describe and characterize a simple rectifier type voltmeter, electrodynamometer, Wattmeter;
3. Draw and describe instrument transformers, DC and AC bridges, universal impedance bridges;
4. Explain operation of electronic instrument for voltage, current, resistance measurements;
5. Explain operation and use of different types of signal/function generators, frequency counters/meters, signal analyzers;
6. Explain the basic features of oscilloscope and different types of oscilloscopes;
7. Describe analog and digital data acquisition techniques, sample and hold circuits, D/A and A/D conversion methods;
8. Demonstrate use of various electronics instruments/transducers to measure the physical quantities in the field of science, engineering and technology..

FEG 390: SIWES II
Second Semester, 3 Units
On the job experience in the industry.
Course 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.

400 LEVEL

CEE 431: Assembly Language Programming

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

Course 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)

- **a)** Development of general programming skills; and
- **b)** Be able to run assembly language code.

CEE 433 DATABASE DESIGN First Semester, 2 Units

Every established organization in Enugu State needs a database for their daily routine activities. The need for daily update of such database arises. Database design is the organization of data according to a database model. This is essential, to guarantee information consistency, eliminate redundant data, efficiently execute queries, and improve the performance of any company or organization, especially in terms of data accuracy and information. It is importance to teach the students of ESUT database so as to prepare them for the world in terms of industrial best practices.

The knowledge of database is imperative to Computer Engineering students while they are in the institution and when they leave the Institution to use it in solving related problems in Enugu State. Many corporate bodies currently use huge databases, for example financial Institutions, communication companies, academic institutions etc. Knowledge of database design methods is important because nearly every digitized process or systems we interact with on a daily basis is built over a database. Websites and applications that use and store data in a structured way have databases.

Course Learning Outcomes

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

1. State the basic concepts and principles of database systems.
2. Design and implement relational databases.
3. Manipulate data using SQL and illustrate the different data retrieval techniques.
4. Describe the basics of data security, privacy, and integrity in database systems.
5. State the various optimization techniques used in databases and the importance of backup and recovery strategies.
6. Apply the concepts and techniques learned in the course to real-world situations.
7. Explain the different approaches for data retrieval and data warehousing.
8. Explain physical storage media and tertiary storage devices, access and organization of records, data dictionary; explain storage structure of object oriented databases.

9. Explain the basic concepts of indexing and hashing, ordered indices, B+ and B– tree index files, explain the concept of static and dynamic hasting, multiple-key access.
10. Explain recovery system, explain log based recovery and shadow paging, recovery with concurrent transaction and DBMS applications.

CEE 445: Computer Architecture *First Semester, 2 Units*

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

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.

CEE 451: Data Computer Networks First Semester, 3 Units

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

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

Course Learning Outcomes

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

1. Identify the different types of computer networks and understand the components of a network.
2. Explain the different types of network topologies and describe the advantages and disadvantages of each.
3. Explain the role of network protocols and the differences between TCP/IP and UDP.
4. Discuss the purpose of IP addressing, the difference between IPv4 and IPv6 addressing, and the concept of subnetting and supernetting.
5. Identify the role of routing in computer networks, the different types of routing algorithms, and the routing protocols used in computer networks.
6. Explain the importance of network security, firewalls' role, and encryption's importance in computer networks.
7. Clarify the role of network services, the importance of DNS and DHCP, and how they are used in computer networks.
8. Simplify the purpose of WANs, the different types of WANs, and the different WAN technologies used in computer networks.
9. Explain the basics of wireless networks, the different types of wireless networks, and the importance of wireless security.
10. Clarify the importance of network management, the role of network monitoring and troubleshooting, and the steps to optimize network performance.

CEE 461: Introduction to Microprocessors First Semester, 2 Units

A basic microprocessor system: the CPU, memory, I/O, and buses subsystems, basic operation of a microprocessor system: fetch and execute cycle, the architecture of some typical 8-bit, 16-bit microprocessors (INTEL, MOTOROLLA) and their features. Programming model in real mode: registers, memory, addressing modes. Organization 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 instruction, multitasking and memory protection, addressing modes, and interrupt systems. Memory interfacing and address decoding. I/O interfacing: memory mapped I/O. isolated I/O, bus timing, I/O instruction. Peripheral devices interfacing: 8255 PPI/6821 PIA, 8251 USART/6821 UART, DMA, Timer/ Counter chips, etc. Instruction set. Assembly language programming of INTEL and MOTOROLA microprocessors. Discussion of a typical system e.g. IBM PC, Apple Macintosh.

Course Learning Outcomes

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

1. Develop an ALP in 8085 microprocessor using the internal organization for the given specification;
2. Describe the architecture and functional block of 8051 microcontrollers;
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 explain microcontroller application and basic architecture of PIC, ARM and ATMEGA processor

CEE 471: Control Systems First Semester, 3 Units

Introduction: definition and examples of control systems. Open-loop and closed-loop control systems. Review of Laplace and inverse Laplace transforms. System modeling: Signal flow graph, block diagram. Transfer function. Poles and zeros. Block diagram reduction using signal flow graph and block diagram reduction techniques. Mechanical, electrical and electromechanical systems. First and second order models, higher order models. Definitions of transient response parameters. Analysis of second-order system as prototype. Routh-Hurwitz stability criterion. Classification of systems based on steady-state characteristics, steady-state error coefficient. Definition of Root locus, Properties of root locus, sketching of root locus plots. Effect of open-loop zeros and poles. Root locus design concepts. Frequency response analysis and design: Bode diagram, Bode plot, Polar plot, Nichols plot. Nyquist stability criterion: non-mathematical description of Nyquist criterion, interpretation of stability. Relative stability -

Gain and phase margins. Closed-loop frequency response analysis - M and N contours, Nichols chart. Compensation techniques: lag, lead and lag-lead compensation, PD, PI and PID controllers. Cascade compensation based on root-locus method. Introduction to Feedback compensation. Computer-aided design and analysis of control system.

Course Learning Outcome

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 discuss non-linear control systems and their characteristics

CEE 491: Laboratory Practical II First Semester, 2 Units

Hands on application development project using Java programming Language

Course Learning Outcome

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

(1) Illustrate hands-on, on the basic steps in software development and maintenance.
(2) Demonstrate writing codes and their executor for simple applications
(3) Implement codes and running of applications
(4) Testing and debug codes written for applications.
(5) Describe and demonstrate code reusability and software implementation.
(6) Develop from scratch programs

CEE493: Circuit Implementation & Prototyping Techniques First Semester, 2 Units

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

Course Learning Outcome

Course Learning Outcomes

Students should be able to:

1. Identify different electronic and electrical components
2. Identify different computer aided design and modelling software
3. Model and simulate some projects
4. Connect circuits in breadboard
5. Prepare printed circuit board
6. Demonstrate connection of circuits using overboard
7. Explain and prepare documents on intellectual property.
8. Discuss techniques in marketing of products.

FEG 490: SIWES II **Second Semester, 6 Units**

On the job experience in industry at higher level of responsibility.

Course Learning Outcome

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.

CEE 531: Cyberpreneurship & Cyber law **First Semester, 2 Units**

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

Course Learning Outcome

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

1. State the fundamentals of cybersecurity and the various security threats faced by modern computer systems and networks.
2. Explain the different types of security controls and the ability to analyze security risks and recommend appropriate mitigation strategies.
3. Demonstrate hands-on skills with security tools and technologies, including virtualization, firewalls, and penetration testing.
4. Demonstrate Critical thinking skills and the ability to analyze security risks and recommend appropriate mitigation strategies.
5. Explain legal and ethical considerations involved in cybersecurity, including privacy, data protection, and intellectual property rights.
6. Trace current research trends in the field and the latest tools and technologies used to enhance cybersecurity.
7. Demonstrate skills needed to work effectively as part of a team, collaborating with others to solve complex security problems

CEE 553: Computer Security Techniques I First Semester, 3 Units

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

System Security, the Trusted Network Interpretation, TNI Security Services, AIS Interconnection Issues, Firewalls [Gateways, Application, Cost and Effectiveness]. Database Security: Security Requirements to Databases, Designing the Security, Methods of Protection, Security of Multilevel Database.

Course Learning Outcome

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

1. State the fundamentals of cybersecurity and the various security threats faced by modern computer systems and networks.
2. Explain the different types of security controls and the ability to analyze security risks and recommend appropriate mitigation strategies.
3. Demonstrate hands-on skills with security tools and technologies, including virtualization, firewalls, and penetration testing.
4. Demonstrate Critical thinking skills and the ability to analyze security risks and recommend appropriate mitigation strategies.
5. Explain legal and ethical considerations involved in cybersecurity, including privacy, data protection, and intellectual property rights.
6. Trace current research trends in the field and the latest tools and technologies used to enhance cybersecurity.
7. Demonstrate skills needed to work effectively as part of a team, collaborating with others to solve complex security problems.

CEE 565: Digital Signal Processing First Semester, 3 Units

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

methods, Gibb's effect and elimination, FIR filter realization. IIR filter: Transfer function, characteristics, applications, overview of analogue filter design techniques, design methods-conversion from analogue to digital filter design techniques, IIR filter realization. Structure of Discrete Time System: Block diagram representation of constant coefficient difference equations, IIR and FIR systems and their basic structures, stability of discrete time systems. Software implementation of DSP algorithms. DSP Microprocessors: Architecture, fixed point versus floating point DSP, Finite word length effects. DSP chips: interfacing and programming. Practical application of DSP in audio, and video

Course Learning Outcome

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 realize various digital filters for digital signal processing; and
4. Understand the applications of DSP in speech processing and spectrum

CEE 573: Microprocessor Based Real-Time Systems First Semester, 2 Units

Real-time control concepts**:** Open loop and closed loop control, feedback sensors and feedback signal conditioning, controlling position, speed and acceleration in real-time. Remote control techniques. Optical isolation and touch-tone techniques. Multiplexing, Open loop control of several devices in real-time. Interrupt-driven real-time events and physical systems: Emphasis is on control of physical devices requiring varying degrees of real-time interaction. Typical projects include microcomputer-based motor control (stepper motors, DC motors and AC motors), traffic light control, software-based real-time element function programming, system monitoring and control.

Operating system environment: The limitations of high-level languages in real-time applications. The linking of machine code and assembly language with high-level language programs for over-coming time constraints. Use of dynamic data structure in interactive environments.

Multiprocessor systems: Inter-processor communication strategies. IEEE-488 General Purpose Interface Bus (GPIB). The S-100 standard. Use of memory communication. Control computer systems: Characteristics of control computers. Performance evaluation.

Course Learning Outcome

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

1. describe Real-time control concepts
2. develop competence in Open loop and closed loop control, feedback sensors and feedback signal conditioning, controlling position, speed and acceleration in real-time.
3. Describe Remote control techniques. Optical isolation and touch-tone techniques. Multiplexing, Open loop control of several devices in real-time.
4. Discuss Interrupt-driven real-time events and physical systems:
5. Project through practical microcomputer-based motor control (stepper motors, DC motors and AC motors), traffic light control, software-based real-time element function programming, system monitoring and control
6. Develop skills in Operating system environment and Multiprocessor systems

CEE 575: Digital Systems Design with VHDL First Semester, 3 Units

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

FPGA.VHDL synthesis, optimization and mapping, constraints, technology library, delay calculation, synthesis tool, synthesis directives. Computer-aided design of logic circuits.

Course Learning Outcome

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.

CEE 583: Artificial Intelligence First Semester, 3 Units

Introduction to artificial intelligence; the study of ideas and techniques that enable computers to behave intelligently; understanding natural languages; knowledge representation; expert systems; fundamentals of fuzzy set theory and fuzzy logic; applications of fuzzy logic – fuzzy control and decision making; Neural Network: Definition of artificial neural network. Similarities of neural network with human brain. Classification of Artificial Neural Network (ANN). Terminologies: input/output sets, weights, bias or threshold, supervised learning, network training, Convergence process, single layer vs. multilayer perception, forward and backward propagation, and gradient descent rule. Back-propagation neural network, Variable terms used in back propagation neural network: learning rate, momentum, hidden nodes, sigmoid activation function. Back propagation algorithm of ANN. Design of ANN model, training sets for ANN, test sets for ANN, network testing and performance.

Course Learning Outcome

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

a) Explain the meaning, purpose, scope, stages, applications and effects of artificial intelligence;
b) Explain the fundamental concepts of machine learning, deep learning and convergent technologies;

c) Demonstrate the difference between supervised, semi-supervised and unsupervised learning;
d) Demonstrate proficiency in Design of ANN model, training sets for ANN, test sets for ANN, network testing and performance
e) Describe Classification of Artificial Neural Network
a) Explain the concept of big data analytics, purpose of studying it, issues that can arise with a data set and the importance of properly preparing data prior to a machine learning exercise; and explain the concepts, characteristics, models and benefits, key security and compliance challenges of cloud computing. Engineering applications. ANN programming.

CEE 597: Technical Communication in Computer Engineering First Semester, 1 Unit

This is aimed at (a) exposing the student to available cutting edge technologies and concepts in Computer Engineering, (b) Techniques in preparation and presentation of technical conference/seminar/workshop papers, Oral communication; Speaking and presentation skills with effective communication in interpersonal and mass communication process. Written communication; principles of technical communication (in particular) use in design research reports. Each student (with the aid of a Supervisor) must choose an appropriate topic, prepare materials for its presentation, and present the paper before an audience that usually includes lecturers and students, concludes with a Q & A session.

Course Learning Outcome

Learning Outcomes

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

a) Demonstrate the concept of clear writing, common pitfalls and unambiguous language in engineering communication, including technical reporting for different applications and emotional comportment;
b) 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

c) Demonstrate good interpersonal communication skills through hands-on and constant practice on real-life communication issues for engineers in different socio cultural milieu for engineering designs, structural failure scenarios and presentation of reports.

CEE 535: Web Design **First Semester, 2 Units**

Definitions and basic concepts; Internet and Intranet, linking to the Net, Web sites and Web pages, characteristics and design basics; HTML web database technology; Internet Information Server (IIS), active data objects (ADO) for application design; script languages (VB script, Java script, etc); Collaboration Data Objects (CDO), internet/intranet security issues; active X DLL distributed COM (DCOM); Microsoft transaction server, visual modeler, DHTML Intranet development, ADO and advanced data types, Java charts, SQL primer.

Course Learning Outcomes:

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

1. Create basic HTML pages with proper semantic structure
2. Describe CSS selectors, properties, and layout techniques
3. Create simple JavaScript programs for adding interactivity to web pages
4. Analyze responsiveness to Web Design and how to create responsive layouts
5. Show knowledge of Server-side scripting and how to connect to databases
6. Integrate APIs in web applications and work with JSON and XML data formats
7. Demonstrate web Security best practices and implement secure login and session management.

CEE555: Design & Installation of Electrical & ICT Services First Semester, 2 Units

Electrical Installation: Introduction to Health and safety at work act in Nigeria. Electrical safety. First aid. Electricity supply regulations. Lighting and Illumination: Luminous intensity and flux. Maintenance factor. Coefficient of utilization. Types of light sources. Calculation of lighting requirements. Glare. Stroboscopic effect. Installation Materials, cables, junction box, terminations,

joints. Conduits and conduiting.Truck and trucking. Electrical Installation design in domestic, commercial and industry. Alarm and emergency systems. Earthling and Protection. Purposes of earthen. Faraday cage. Rod electrodes. Earth electrode resistance. Earthen system. Earth fault loop impedance. ICT services: NCC and FCC codes of practice and standards. Telecommunication design and installation: Satellite, VSAT, etc. Telephone design and installation. Computer networking design and installation. Wireless LAN design and installation. Preparation of Bill of Engineering Measurement Evaluation. Contract bidding. Consultancy.

Course Learning Outcomes:

Students at the end of this course should be able to:

1. Design CCTV and other security systems
2. Install Solar Panel systems and other electrical installation.
3. Practice Wireless LAN design and installation.
4. Recognize ICT services, NCC and FCC codes of practice and standards.
5. Implement electrical installation design in domestic, commercial and industry.

CEE 585: Fuzzy Logic & Programming First Semester, 2 Units

Introduction: fuzzy set theory, knowledge base problem, objective and subjective knowledge, crisp sets, fuzzy sets, linguistic variables, membership functions. Settheoretic operations, comparison between crisp sets and fuzzy sets. Law of

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

Course Learning Outcomes

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

a) Explain: fuzzy set theory, knowledge base problem objective and subjective knowledge,
b) Explain crisp sets, fuzzy sets, linguistic variables, membership functions.
c) Interpret Set theoretic operations, comparison between crisp sets and fuzzy sets. Law of Contradiction and Law of Excluded Middle, fuzzy intersection, union and complement, and other fuzzy operators
d) Apply Fuzzy relations and compositions on the same and different product spaces.
e) Implement Max-Min composition, Max-Product composition, fuzzy relational matrix, sup-star composition Max-Product composition, fuzzy relational matrix, sup-star composition.
f) Demonstrate Fuzzy reasoning and implication, the fuzzy truth tables, traditional propositional logic and the rule of inference, the Modus Ponens and Modus Tollens, fuzzy modeling with causal IF-THEN statements
g) Apply Fuzzy Models, fuzzy logic systems, combination of fuzzy basis functions, universal approximator, fuzzy neural network, fuzzy associate memory matrix, self-learning fuzzy systems

CEE 572 Instrumentation Engineering II Second semester, 2 unit

Course work and laboratory sessions emphasizing the design of instruments for measuring and controlling industrial processes. The scope of each topic includes micro computer controlled measurements. Thermal systems: Thermo resistive sensing elements: display arrangements for thermo-resistive instruments;

thermocouple indicators and their use in millivolt pyrometers determining system: Float and liquid displaced level sensors. Level determination by means of electrical conductivity of liquids. Radiation, ultrasonic, pressure-sensitive and weight level determination techniques. Load-cell and photo-electric level control systems. Automatic liquid level control systems: pressure basics. Industrial hydraulic and pneumatic systems. State and steam pressure systems; pressure system; pressure system components. Flow process systems; Flow process principles. Classification of flow process equipment. Flow meters (head, magnetic, velocity, positive-displacement and ultrasonic types). Relative advantage of various types of flow meter in liquid and gap measurements. Analytical process systems: Analytical process classifications electric or magnetic field instruments; thermal or mechanical energy instruments; electromagnetic radiation instruments; and chemical energy instrumentation, Maintainability Analysis; the process of translating system-level operational and maintenance requirements into specific qualitative and quantitative equipment design requirements. Equipment failure prediction techniques.

Course Learning Outcomes

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

a) Apply the concepts of automatic control, including measurement, feedback and feed forward regulation for the operation of continuous and discrete systems.
b) Design and implement systems utilizing analog/digital control devices.
c) Apply the concepts of chemistry, physics & electric/electronics to measurement & control systems.
d) Apply the concepts of digital and microprocessor systems and functionality of system components/devices for the automation of processes.
e) Apply the concepts of measurements and sensor selection.
f) Communicate the technical details of control systems using current techniques and graphical standards.
g) Apply the concepts of mechanics, fluid mechanics, and heat transfer to the design of process control systems.
h) Understand and utilize programmable logic controllers (PLC), distributed control systems (DCS) and supervisory control systems for control of manufacturing and processing systems.

i) Demonstrate proficiency in the utilization of differential and integral calculus and ordinary differential equations in the design, analysis, and performance assessment of control systems.
j) Demonstrate the ability to utilize modern and effective management skills for performing investigation, analysis, and synthesis in the implementation of automatic control systems.

CEE 534: Computer Graphics & Animations Second Semester, 3 Units

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

Course Learning Outcomes

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

1. Explain the basics of computer graphics.
2. Interpret essential mathematics in computer graphics.
3. Apply mathematics to graphics systems.
4. Implement common data structures to represent and manipulate geometry.
5. Demonstrate common approaches to model light and materials.
6. Apply basic shading techniques.
7. Apply basic image-processing techniques.
8. Explain how the human visual system plays a role in interpretation of graphics.
9. Perform color and light representation and manipulation in graphics systems

CEE 536: Software Engineering Second Semester, 3 Units

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

Course Learning Outcomes

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

1. State the fundamentals of software engineering Number representations. Data structure and algorithms, Abstraction, modules and objects.,
2. Explain the different types of Object oriented programming
3. Demonstrate hands-on skills on object oriented software design, implementation and testing.
4. Demonstrate Critical thinking skills and the ability to advanced software algorithms and architecture.
5. Explain team software specification and management, cross-platform tools and GUI development programming

CEE 556: Reliability and Maintainability Second Semester, 3 Units

Introduction to reliability, maintainability. Reliability specification and metrics. Application to computer hardware system, communication equipment, power systems, electronic component. Basic maintenance types and procedures of computer and digital communication system. Fault troubleshooting techniques. QoS and time of availability of data communication. Quality control techniques. Design for higher reliability, fault tolerance. Software Reliability: software reliability specification, software reliability Metrics, fault avoidance, fault tolerance, programming for reliability, software safety and hazard analysis.

Comparison of hardware and software reliability. Software quality and Assurance definition of software quality, software quality factor, quality control, cost of quality, quantity assurance. SQA activities, formal technical reviews, software quality metrics, statistical quality assurance. ISO 9000 Requirement and Certification, ISO 9000-3 for software quality process, process documentation, quality audit. Capability Maturity Model: Software Engineering Institute, level of maturity, key process areas, Comparison between ISO 900 Standards and CMM.

Ensuring Quality and Reliability: verification and validation, measurement tracking and feedback mechanism, total quality management, risk management.

Course Learning Outcome

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

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 analyze reliability data;
4. Apply engineering techniques to predict expected life of the specific component, product or system; and establish risk analysis and quality control on engineering systems.

CEE 574: Embedded Systems Design **Second Semester, 2 Units**

Introduction to embedded system, components, characteristics, applications. Intel 8051/8031 Micro-controller: Features of the 8051/8031 family, block diagram and definitions of the pin of the 8051, I/O port structure, memory organization: general purpose RAM, bit addressable RAM, register bank, special function registers, external memory, memory space mapping and decoding, bus control signals timing, a typical 8051 micro-controller based system. Instruction Set and Assembly Language Programming: Addressing modes, the 8051 instruction set and typical examples, assembler operation, assembly language format, assembler directives, operation of assemblers and linkers, programming examples. On-chip Peripheral Devices: I/O ports, operations and uses of port 0, port 1, port 2, port 3, timers: their operations, programming, and applications, serial port: operations and programming, typical applications, serial port interrupt. Interfacing to external memory, keypad, seven-segment LED display, ADC and DAC chips, and input / output port expansion, description and uses of hardware development tools. MOTOROLA M6811 Micro-controller: Features of the M6811 family, block diagram and definitions of the pin of the M6811, I/O port structure, memory organization: general purpose RAM, bit addressable RAM, register bank, special function registers, external memory, memory space mapping and decoding, bus control signals timing. Instruction Set and Assembly Language

Programming. On-chip peripheral devices and I/O interfacing. Introduction to PIC microcontroller: general architecture, applications and selection of microcontroller, advantages, low-end, and high performance PIC. Specific PIC microcontrollers: Features, architecture, block diagram, pin configuration, on-chip memory, and peripheral. Instruction set and Assembly language programming. Serial I/O interfacing: I2C, and SPI interfacing and programming. Memory interfacing: external memory interfacing, EEPROM and Flash memory interfacing. Design exercises using development system.

Course Learning Outcomes

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

1) Define what an embedded system and outline its features.
2) Analyze the major differences between microprocessor and microcontrollers
3) Describe the architecture and functional block of PIC Microcontroller, Arduino Microcontroller, Raspberry Pi, AVR and ESP32 microcontrollers
4) Develop an embedded C and ALP in PIC Microcontroller, Arduino Microcontroller, Raspberry Pi, AVR and ESP32 microcontrollers using the internal functional blocks for the given application.
5) Design and develop IOT and other embedded system projects using these microcontrollers

CEE 599: Project **Second Semester, 6 Units**

Final year Research Project (Design and implementation of a sufficiently complex, useful and relevant hardware and/or software system), is assigned to a student in the first semester and ending in the second semester under the supervision of a member of academic staff. This is followed by the development of a bound project report in partial requirement for the award of Bachelor Degree in Computer Engineering. Lastly is defense of the system design, its operation and documentation (demonstration, explanation, questions and answers is involved in this) before the CEE Academic Board.

Course 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.

CEE 554: Computer Security Techniques II

Course Learning Outcomes

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

1. State the fundamentals of cybersecurity and the various security threats faced by modern computer systems and networks.
2. Explain the different types of security controls and the ability to analyze security risks and recommend appropriate mitigation strategies.
3. Demonstrate hands-on skills with security tools and technologies, including virtualization, firewalls, and penetration testing.
4. Demonstrate Critical thinking skills and the ability to analyze security risks and recommend appropriate mitigation strategies.
5. Explain legal and ethical considerations involved in cybersecurity, including privacy, data protection, and intellectual property rights.
6. Trace current research trends in the field and the latest tools and technologies used to enhance cybersecurity.
7. Demonstrate skills needed to work effectively as part of a team, collaborating with others to solve complex security problems.

CEE 554: Computer Security Techniques II Second Semester, 2 Units

History of cryptographic System, Public Key Systems, Digital signature. Information Theory: Entropy, Perfect Secrecy, Unicity Distance, Complexity Theory, NP Completeness, Number Theory. Data Encryption Method Ciphers, Knapsack Ciphers, Breakable NP-Complete and Stream Ciphers, Auto key, Endpoints of encryption, One-way ciphers, Password and Authentication, Secret Keys and Public Keys, Threshold scheme. Video Scrambling techniques. Digital video encryption techniques: principle, IRDETO, via access, Video guard etc. Security and Legality Issues: copyrights Patents, trade secret, Ownership of Products, Computer Crimes, Ethnical Issue in Computer Security

Course Learning Outcomes

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

1) define digital image processing
2) get familiarized with problems, and applications of digital image processing
3) design and realize various Digital image acquisition devices. Digital image formats.
4) Understand Image restoration techniques. Image registration techniques Morphology. Fourier transform and Wavelet transform in image processing.
5) Explain Image understanding. Artificial neural network, Color representation standards, equations, processing, quantization, and dithering.
6) Analyze Case study in practical application of image processing to face recognition, fingerprint, iris, etc.
7) Discuss image compression techniques.

CEE 568: Digital Image Processing Second Semester, 2 Units

Introduction: definition, problems, and applications of digital image processing. Digital image acquisition devices. Digital image formats. Edge detection techniques, segmentation methods. Image Morphology. Image enhancement.

Image restoration techniques. Morphology. Fourier transform and Wavelet transform in image processing. Image registration techniques. Shape analysis. Image understanding. Artificial neural network and image understanding. Color representation standards, equations, processing, quantization, and dithering. Case study: practical application of image processing to face recognition, fingerprint, iris, etc. Introduction to image compression techniques.

Course Learning Outcomes

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

1) define digital image processing
2) get familiarized with problems, and applications of digital image processing
3) design and realise various Digital image acquisition devices. Digital image formats.

4) Understand Image restoration techniques. Image registration techniques Morphology. Fourier transform and Wavelet transform in image processing.
5) Explain Image understanding. Artificial neural network, Color representation standards, equations, processing, quantization, and dithering.
6) Analyze Case study in practical application of image processing to face recognition, fingerprint, iris, etc.
7) Discuss image compression techniques.

CEE 576: Robotics &Automation Second Semester, 2 Units

Robot classification and manipulation. Technology and history of development of robots. Applications. Direct and inverse kinematics: arm equation. Workspace analysis and trajectory planning. Differential motion and statics. Manipulator dynamics. End-of arm tooling. Automation sensors. Robot vision. Work-cell support systems. Robot and system integration. Safety. Human interface. Robot control system. Circuit and system configuration. Task oriented control. Robot control programming. Fuzzy logic and AI based robot control. Fundamentals of

automation. Strategies and economic consideration. Integration of systems. Impact to the production factory. Evaluation of conventional processes. Analysis of automated flow lines. Assembly systems and line balancing. Automated assembly systems. Numerical control and adaptive control. Robot applications. Automated materials handling and storage systems. Automation in inspection and testing. Linear feedback control system. Optimal control. Computer process control. Computer integrated manufacturing systems. Future automated factory.

Course Learning Outcomes:

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

1. Apply a comprehensive understanding of fundamental principles and practices of robotics.
2. Develop practical skills in the design, construction, and programming of robots, using industry-standard tools and techniques.
3. Develop critical thinking skills, enabling them to analyze and solve real-world problems in robotics.
4. Apply their knowledge and skills to independent research projects, exploring new frontiers in robotics technology and applications.

5. Design projects for careers in the rapidly growing field of robotics, where they can make a positive impact on society by developing innovative solutions to real-world challenges

2.0 LIST OF ACADEMIC AND NON ACADEMIC STAFF

2.1 List of Academic Staff

S/N	Name Of Staff	Rank/Designation	F/T	Qualification
1	Prof. E. C. Okafor	Professor,	F/T	B.Eng. (ASUTECH), M. Eng. (UNN) Ph.D. (UNN), MNSE, COREN
2	Dr. F. A. Okoye	Associate Professor	F/T	B.Eng (ESUT) M.Sc (EBSU) Ph.D (ESUT), MCPN, MCOAN MNSE, COREN
3	Dr. H. N. Nwobodo-Nzeribe	(Head of Department) Associate Professor	F/T	B.Eng (ESUT), M.Eng (ESUT) Ph.D.(NAU) , Mphil, (ARU, UK) MNSE,COREN,MSWE,, MAPWEN,MIEEE
6	Prof. C. A. Mgbachi	Professor	F/T	B.Eng., M.Eng., Ph.D. 2014
7	Dr. T. T. Chiagunye	Assoc. Senior Lecturer	P/T	B.Eng (ESUT) , M.Eng (NAU) Ph.D. (NAU) , MNSE, COREN, MCPN
8	Dr. V. N. Okorogu	Assoc. Senior Lecturer CONU 5	P/T	B.Eng (ESUT), M.Eng (ESUT) Ph.D.(ESUT), MBA (UNN) MNSE, COREN, IEEE
9	Dr. L. O. Nwobodo	Senior Lecturer	F/T	B.Eng. (ESUT), M.Eng (NAU), Ph.D. (NAU) ,MNSE, MAPWEN, COREN
10	Dr Obasi Chukwuemeka	Senior Lecturer	F/T	B.Eng, M.Eng , PhD, MNSE, COREN
11	Dr. P.C. Eneh	Senior Lecturer	F/T	B.Eng, M.Eng , PhD, MNSE, COREN
12	Dr. Uche Okafor	Senior Lecturer	F/T	B.Eng. , M.Eng , PhD, MNSE, COREN
13	Dr. B. E. Ibekwe	Senior Lecturer	F/T	B.Eng.1987, B.Eng. 2000 M.Eng. 2008, Ph.D. 2017, MNSE COREN
14	Dr. S. P. N. Obuka	Senior Lecturer	F/T	B.Eng. , M.Eng , PhD MNSE, COREN
15	Dr Oleka Chioma V.	Lecturer I, CONU 3	F/T	B.Eng (ESUT) , M.Eng (NAU), Ph.D. (NAU) , MNSE, COREN, IEEE
16	Dr Ozor, Godwin O.	Lecturer I	F/T	B.Eng (ESUT) ,M.Eng (NAU), Ph.D. (NAU) MNSE, COREN, IEEE

17	Engr. Nduanya Ujunwa	Lecturer I	F/T	B.Eng. (ESUT),M.Eng (NAU) PhD (NAU) in view, MNSE, MAPWEN, NWIIT,COREN, IEEE
18	Dr. Chika .M.Onuigbo	Lecturer I	F/T	B.Eng. , M.Eng , PhD
19	Dr. S.N. Arinze	Lecturer II 2019	F/T	B.Eng. 2006, M.Eng. 2012 Ph.D. 2019 ,R.31788
20	Engr. Samuel Ani	Lecturer II	F/T	B.Eng., M.Eng PhD in view
21	Engr. Odo Ikechukwu	Lecturer II,	F/T	B.Eng. (ESUT) , M.Eng (NAU) PhD (UK) in view MNCS
22	Engr. Orji, E. Zeluwa	Lecturer II,	F/T	B. Sc (Ukraine),, M. Sc (Ukraine), Ph.D (Cyprus) in view, MNSE, COREN
23	Engr. Ozioko, Erasmus I	Assistant Lecturer,	F/T	B.Eng ESUT , M.Sc (LSBU, Lond),Ph.D.Turkey (in view)

2.2 List of Technologists

S/N	Name of Staff	Rank/Designation	Qualification
1	Engr. Mba Rufus-Jack	Chief Technologist	HND (Idah Poly) PGD, M.Eng (ESUT)
2	Okamkpa Ukamaka E	Principal Tech	B.Eng. (ESUT)
3	Ujam, Evelyn	Principal Tech	B.Eng. (ESUT)
4	Ugwuoti, Nnamdi	Principal Tech	B.Eng. (ESUT)
5	Nwankwo, Godson Sunday	Principal System Analyst	B.Eng. (ESUT)
5	Eneh Samuel Afam	Technologist II	B.Eng. (ESUT)
6	Omene Christian	Technologist II	B.Eng. (ESUT)
7	Enekwe, Gladys	Ass Chief Supervisor	GCE 2002, B.SC 2004
8	Ano, Benedeth	Higher Lab.Supervisor	SSCE 1991
9	Anyaegbunam, Felicia	Senior Lab. Supervisor	FSLC 1982

2.3 List of Administrative Staff

S/N	Name of Staff	Rank/Designation
1	Ezinwa Eucharia U.	ACEO
2	Nweke Ernest Izuchukwu	ACEO

3	Eze Promise Nneka	ACEO
4	Nwobodo Beatrice I.	Higher Caretaker

3.0 GENERAL GUIDELINES FOR STUDENTS

Important information to note for progress through the degree programme:

3.1 Academic Advisory

Every student is assigned an academic adviser who guides him/her throughout his/her studies in the university.

3.2 Matriculation

A student admitted into the university for the first time to study for a degree (including transfer students), will be required to matriculate and sign the matriculation register.

3.3 Registration

Proper and timely registration is very important under the course unit system. This is so because the programmes of the students are somewhat individualized under the course unit system. Students who attempt the examination in courses for which they have not registered will obtain no results in the courses.

4.0 GUIDELINES FOR COURSE REGISTRATION

4.1 General Information

Registration begins with the payment of the stipulated fees and other charges of the university through the designated banks. Official University receipt for fees paid can be printed online or gotten from the Faculty finance officer. Course registrations are done online on ESUT portal and course forms printed. Any student who by chance sits for semester examinations without paying school fees and other charges will receive no results of the examinations. Request for the release of the result of such students may be considered only after:

- He/she has paid all fees owed to the university
- He/she has paid a late result processing fee approved by the University.

All students must register for courses at the beginning of each semester of a

session in accordance with the rules made from time to time by the university. Normal registration for courses ends two weeks after the beginning of each semester.

Registration forms must be carefully and correctly filled out. Cancellation(s), erasure(s), mutilation(s), correction(s) with correction fluid, etc. are not allowed on the forms. Academic advisers are to be consulted before filling the registration forms.

Courses are registered at the beginning of every session. Failed courses are registered first and higher-level courses are then added to make up the approved maximum of 24 credits per semester (if the student is advised to carry the full load). Late registration may be allowed only on payment of a penalty fee, which varies from time to time according to the university regulations.

If the timetable permits, a third-year student may take a lower or higher-level course, provided that he/she has the prerequisites for the course.

A student does not repeat an entire year of study unless his/her cumulative grade point average falls below 70. Such student repeats only those courses which he/she failed. Students carrying over courses will not be allowed to register more than 48 credits per session.

4.2 **Fee payment procedures**

1. Visit the University website (esut.edu.ng), click on ESUT Portal at the right hand corner of the page. OR Type portal.esut.edu.ng on the URL address box and login to your ESUT account.

2. Generate an invoice for the payment you wish to make and ensure you write down the reference number of your invoice eg. To pay school fees, login to ESUT portal, go to School fees module, Click on generate invoice to get the invoice. The system will allow you fill the session and level, click generate.

3. Pay the school fees in the bank, come back to the portal, 'pay school fees' sub m fill the session and the reference number gotten from the bank.

The system will generate an online school fees receipt for you. Use the reprint school fees to reprint the receipt if there is need for that

4. You can access quick teller directly through their web address thus: www.quickteller.com/esut. At this point ESUT quick teller home page opens for you to key in the following: valid e-mail/phone number,

reference number on your invoice, the exact type of payment you want to make, such as school fee, certificate fee, acceptance fee etc.

5. Click on "continue". This open payment gate way, on the right side of the screen. This must

   bear the name of the person on the invoice used.

6. Fill in all the ATM card details as required by quick teller and click on OTP code "Pay" to your. This phone as well as notification for debit to your account.

7. If the payment is successful, the needed amount will be debited from your account. You will be required to click on

   "Print Receipt" and quickeipttelle for you to print and keep as your evidence of payment.

NOTE: Ensure there is a reliable and stable internet service in the device which you are using for this payment.

4.3 Course Registration

Login to ESUT portal. The Course Registration module allows you to register your course per semester, fill the session and semester and click submit.

4.4 Credit Unit System

The Faculty/Departmental programmes are run on a modularised system called **course unit system**. All courses are therefore subdivided into more or less self-sufficient and logically consistent packages that are taught within a semester and examined at the end of that particular semester. Credit weight are attached to each course. One credit is equivalent to one hour per week per semester of 15 weeks of lectures or 2 hours of tutorials or 3 hours per week of laboratory/studio work per semester of 15 hours. Thus, a Credit Unit (Load) is equivalent to 15 lecture hours or 30-45 hours of practical, studio work, or tutorials per semester of fifteen weeks.

4.5 Minimum and Maximum Credit Load

A student will normally in any academic year be allowed to register for, and take a minimum of 30 credit and a maximum of 48 credit. Thus, no student will be

credited with more than 48 credits at the end of each academic year. Without prejudice to the above, A graduating student may register for only the number of credits he requires to graduate. Students may be examined by continuous assessment, which forms part of the end-of-course grading, provided that it does not count for more than 30% of the final mark in the course.

4.6 Add and drop form

The add and drop forms are obtainable at the faculty office to enable students to add to the courses within the approved maximum units for a semester and drop any course within a stipulated time as may be reflected on the university calendar issued at the beginning of every semester.

4.7 Change of Programme

Students are allowed to seek change within and outside the Faculty. The form for this dispensation is obtainable at the Academic Affairs Unit of the registry for free and must be completed within a stipulated period as may be fixed by the university. Students willing to change programme must satisfy minimum admission requirements of the new programme and must have been duly released by their Departments and Faculties before they can be accepted in the new departments.

5.0 COURSE NUMBERING SYSTEM

5.1 Course Numbering System

A three-digit code is adopted as follows: the first digit denotes the level or year of study. The second digit denotes the subject area (specialist or stress area). The third digit denotes the order in which the courses are given. Odd digits are for First Semester while even digits are for Second Semester.

5.2 Core Courses

Core Course are courses that must be offered and passed by all students in any undergraduate programme.

5.3 Elective Courses

Elective Courses are courses which can be registered only on the advice of the Academic Adviser as required courses, and which must be passed by a student so advised in order to graduate.

5.4 Optional Course

Optional Course are courses that may be taken by a student to make up the minimum Credit required in a semester.

6.0 ATTENDANCE TO LECTURES

6.1 Adherence to Lecture Timetable

Staff and students must adhere to the days and time on the approved lecture timetable for each lecture. It is not allowed to change lecture days and time without proper approval from the Department.

6.2 Minimum Required Attendance to Lectures

Students are required to record a minimum of 75% attendance to lectures to be qualified to seat for exam for that particular course. Failure to achieve the required minimum attendance to lectures may disqualify the student from writing exam for that course.

6.3 Code of Conduct for Students

1. Punctual and regular attendance at lectures, tutorials, seminars, and practical classes is compulsory.

2. A student who has a genuine reason to be absent from any of the activities listed above must first obtain permission from the lecturer (s) or personnel in charge.

3. Students must not be involved in any clandestine activities like cultism.

4. Students must consult with their level Advisor or such persons that may be knowledgeable about the operation of the course unit system for necessary information.

5. Students should learn how to compute their semester GPA as well as CGPA and keep accurate records of their academic performance.

6. Students should not disturb the peace and order of the Faculty or Department through noise-making operating musical instruments or using drumming.

7. Handsets must be switched off during lectures, tutorial, seminars, practical classes, etc.

8. Students should shun fighting and any other violent acts.

9. Students must treat one another with respect.

10. Students should maintain an honest life.

11. Students should work hard, recreate and pray.

12. Students are advised to dress moderately decently.

7.0 EXAMINATIONS

7.1 Examination Conduct and Invigilation

i. Students shall use their registration numbers and not their names during university examinations.
ii. The university shall supply a printed answer booklet for all semester examinations. The booklets used and unused should not be removed from the examination hall by the candidates.
iii. The information required on the cover page of the examination booklet must be clearly and legibly completed by students.
iv. No student is allowed to bring any material into the examination hall.
v. Except in cases of ill health or accident, no candidate shall be allowed to leave the examination hall within 30 minutes of the commencement of the examinations or to enter the hall after the first 30 minutes.
vi. There shall normally be not fewer than two invigilators in one examination room. In large halls, a ratio of one invigilator to 50 students shall be maintained.
vii. Invigilators shall be drawn from the academic and other related staff of the university.
viii. The invigilators shall keep an officially prepared examination attendance list, which all students taking the examination must sign. The invigilators must reconcile the number on the attendance register with the number of scripts submitted.
ix. Each examination shall have a chief invigilator, who shall collect examination materials from the faculty officer 30 –40 minutes before the examination begins.

7.2 Answer Booklet Regulations

1. Begin your answer to each question on a fresh page.
2. Write the number of each question at the top of each page.

3. Answer books must not be removed from the examination room.

4. Enter in the column provided the question numbers in order attempted.

5. Read examination offences and their punishments/penalty overleaf the answer booklet (Session 9.4 of this handbook).

7.3 Absence from Examination

If for no good reason, a student fails to attend an examination, no special papers will be set and the students shall be deemed to have failed.

7.4 Illness During an Examination

A candidate who wishes to withdraw from an examination because of illness should inform an invigilator. The candidate may be escorted to the university health service.

If a candidate is temporary whether by illness but can continue the examination after a short absence, the time lost through illness will be noted and the information taken into consideration where appropriate.

7.5 Participation in Examination without Registration

Students can only seat for examinations of courses they have registered for. This means they must have paid relevant feesand have duely registered their courses and have attended lectures as required.

8.0 Tips for Examination

All candidates should read carefully the university examination regulations.

8.1 Fee: No student will be allowed into an examinationwhen he/she is owing fees the examination fee must be paid and the ICT exam number obtained.

8.2 **Timetable:** for invigilated examinations, draft andfinal timetables will be available. Students are asked to check that all their papers appear on the draft. If there are any clashes or missing papers, students should contact the Department Time-table Officer. The examination halls in which papers are held will be included on the final time-table.

8.3 Smoking and the consumption of alcoholic drinks: are not allowed in the examination halls.

8.4 **Admission to the hall:** candidates will be admitted tothe hall a few minutes before the start of each examination.

8.5 Late arrival and early departure: candidates who are more than 30 minutes late for an examination may not be admitted. A candidate will not be allowed to withdraw from an examination until 40 minutes have elapsed. Any candidate leaving an examination must do so quietly and take great care not to disturb other candidates. No candidates will be allowed to leave during the last ten minutes of an examination.

8.6 **During the few minutes before the examination begins:**

Candidates must:

a) Listen carefully to any announcements the chief invigilator may have to make

b) Make sure that they have the correct question paper on their desks: if in doubt they should put up a hand and ask an invigilator.

c) Complete the attendance slip on the desk, (this will be collected by an invigilator soon after the start of the examination). This may be in addition to thermometric identification.

d) Complete as far as possible the cover sheet of one answer book on the desk

e) Read the notes on the cover of the answer book.

If candidates require further stationery: during the examination, they should put up a hand and an invigilator will bring it to them.

Temporary withdrawal: a candidate who wishes to make a temporary withdrawal from an examination for personal reasons must put up a hand and ask to be accompanied by an invigilator or other authorized person.

8.7 End of an examination

At the end of an examination, all answer books, continuation sheets (even if only used for rough notes) and graph paper should be fastened together with string. If more than one bookis used, all relevant papers should be fastened in their appropriate book. All cover sheets of used answer books must be completed and candidates must enter in the space provided the number of questions answered

within, in the order in quickly and quietly when permitted to do so, leaving all written work on the desk. Question papers may be removed from the hall only if no instruction to the contrary is given.

9.0 EXAMIATION MALPRACTICE / IRREGULARITIES

9.1 Introduction

Examination malpractices are irregularities or infringements of the regulations during the conduct of an examination. These include but are not limited to students copying from each other, bringing into the examination hall papers, books, or other implicating materials, walking about and causing any form of disturbance, not observing the time regulations of the examination, disobeying, insulting, or fighting the invigilator(s). The chief invigilator is required to make a written report immediately using the prescribed form, on each case of examination malpractice or irregularity to the Dean of the relevant faculty through his/her HOD. If need be, extra sheets of paper should be used to include details not included in the form but which are important to the case. The invigilators shall as much as possible control the situation in the examination hall. An on-the-spot statement should be obtained from the student by making him/her read and sign the filled form, He/She should be asked to write his/her side of the malpractice story on the spot and submit it to the chief invigilator.

9.2 Procedure for Dealing with Examination Malpractice/ Irregularities

The following procedure will be adopted in dealing with examination malpractice:

i. The chief invigilator concerned shall through his HOD submit three copies of the completed exam malpractice form together with other reports (if any) and necessary attachment to the Dean of the faculty offering the course within two working days of the incident. The HOD keeps one set of the document and forwards two sets to the Dean.

ii. The Dean shall refer the matter to the relevant examination committee through the examination office of the registry by forwarding one set of the documents in his/her office.

iii. The relevant examination committee shall invite the student(s) to appear before it and clear him/herself of the allegations.

iv. The Dean of the faculty through the Head of the Department shall inform the concerned student(s) at the time the report was made to the committee and before their departure for a vacation that they have cases to answer so that they will be available at the time the committee will sit to deliberate on the allegations.

v. The relevant examination committee shall commence an investigation within one week of the exams. The

committee may obtain written or oral evidence from the witness, the invigilator(s), the student concerned, and any others, if necessary. Thereafter the committee shall submit its findings and recommendations to the Senate for final action.

vi. Any student found guilty of examination malpractice may be subjected to any of the following, depending on the gravity of the offence(s) committed and any appropriate recommendation of the committee.

1. The student may be issued a warning

2. The student may fail the examination

3. The student may be sent down for one semester, one year, etc. as the case may be.

4. The student may be expelled

5. Any other appropriate punishment as prescribed by the committee in line with approved sanctions.

vii. Any other person who observes any examination malpractice or irregularity shall be free to file a report to the exam 'stheregistry. office of

9.3 Examination Offences

The various examination offences committed by students are generally categorized as follows:

1. Offences punishable by expulsion from the university

2. Offences punishable by suspension for one year or more.

3. Offences punishable by issuing a student with a written warning.

The following sanctions are recommended as appropriate for the various examination offences, which are very common among students.

9.4 Punishments for examination offences

The accompanying punishments for the different categories of examination irregularities as approved by the senate are as follows;

Group A: Offences punishable by expulsion from the university.

i. Assault on the invigilator

ii. Impersonation –when the impersonator is not a student of ESUT, he/she should be handed over to the police and if he/she is from another tertiary institution and his particulars are known, he should be reported to his institution.

iii. Involvement in alteration of grades.

iv. Being in possession of any dangerous weapon in and around the examination venue. (Also, the student should be handed over to the police).

Group B: offences punishable by three (3) years suspension.

i. Involvement in examination leakage.

ii. Destruction of evidence relevant to the case.

iii. Smuggling already prepared answer script into the examination hall.

Group C: Offences punishable by three (3) years suspension for the second offender and two (2) years for the first offender.

i. Being in possession of material relevant to the examination.

ii. Refusal to surrender exhibit in connection with the examination offence.

iii. Snatching of answer script from another student.

iv. Writing solutions on any part of the body or clothes.

v. Uses of calculators and phones to store solutions relevant to the solutions.

Group D: Offences punishable by three (3) years suspension for the second offender and one (1) year for the first offender.

i. Smuggling out answer scripts from the exam hall.

ii. Smuggling out examination questions from the exam hall.

iii. Exchange of answer scripts during an examination for the partners.

iv. Failure/refusal to submit answer script after an examination.

Group E: Offences punishable by three (3) years suspension for the second offender and one (1) year for the first offender.

i. Writing solutions on any part of the question paper.

ii. Exchanging question papers with solutions written on any part of them.

iii. Cheating by peeping into ano an examination.

iv. Displaying one's work for an

v. Talking to, or with another student during an examination; e.g., refusal to relocate, refusal to stop writing, refusal to sign in and out, undue delay in submitting answer script at the end of the examination.

vi. Creating a disturbance during the examination, e.g., shouting a slogan, shuffling feet unduly, whistling, fighting (both partners), assaulting another student, causing panic, etc.

vii. Unjustified verbal attack on the invigilator.

10.0 RESULTS

10.1 Incourse Assessment

Incourse assessment is done through assignments or home work, tests or quizzes and practical excercises. Incourse carries a maximum weight of 30% - 40% of the final marks for courses which are primarily theoritical. For courses that are partly practical and partly theoretical, scores from incourse constitute 50% of the final marks. For courses that are entirely

practical, incourse are based o reports and shall constitute 100% of the final marks.

10.2 Written Examination Assessment

In addition to incourse, final examination is normally given for every course at the end of each semester that the course was taught. The final grade for examination subject to section 10.1 of this document is 60% - 70%. A written examination shall normally last for a minimum of one hour for one unit course.

In student assessment, examiners will be looking for evidence

of “knowledge”, “skill’’, ‘’unde

Knowledge: The faculty information imparted in the course:

Still: The ability to execute relevant analytical procedures sothat the knowledge can be used.

Understanding: The ability to use the knowledge, skill, and understanding in a situation that is beyond those covered directly in the course.

10.3 Grade Point System

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

10.4 Probation

A student whose Cumulative Grade Point Average (CGPA) is below 1.50 at a particular year of study, earns a period of probation for one academic session. When on probation, the student is allowed to register for courses at the next higher level in addition to his/her probation level courses provided that: The maximum of 24 credit units per semester is not exceeded and

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

and

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

10.5 Repeat of a Year/ Withdrawal

A candidate whose CGPA is below 1.50 at the end of a particular year of probation is required to withdraw from the University. However in order to minimize waste of human resources, the student may be considered for possible transfer to other programmes within the same University.

10.6 Carryover Courses

There is no resit of examination in the Department. Any failed course is carried over to the next session of the same semester the course was failed. Carryover courses are registered first before the current year courses.

10.7 Release of Results

Semester results are due for submission to the Department one month after the last day of examination for the semester. Submitted results go through Departmental, Faculty and University senate approvals before results are released to the students via their academic advisers.

11.0 GRADUATION REQUIREMENTS

11.1 Duration of Programme

The minimum duration of the programmes is five academic sessions for candidates who enter with Senior Secondary School Certificate (SSCE) or GCE

Candidates with relevant passes in Mathematics, Physics, and Chemistry at GCE 'A' Level or minimum of four academic sessions provided that they satisfy all the other University requirements. Candidates with HND, relevant Bachelor's Degree, or minimum of three sessions.

11.2 Industrial Training (IT) Requirements

Industrial Training lasts for only six months, that is, the whole of the second semester of the fourth year of the regular Bachelor of Engineering programme. It is designed to allow students to put into practice the knowledge that they have acquired in the classroom. It is a prerequisite for graduation.

1**1.3 Coursework/Project Requirement**

To be eligible for a Bachelor of Engineering Degree in any Department in the Faculty, a student must complete the following:

- University Common Course
- Intra and Inter-Faculty Courses
- Departmental Core Courses
- Six Month Supervised Industrial Training
- An original Research Project satisfactorily
- Students Industrial Work Experience
- Supervised Entrepreneurial Practical Work

11.3 Payment of Fees Requirement

Students must clear all debts to the University, Faculty and Department to be eligible for graduation.

11.5 Degree Classifications

The determination of the class of degree is based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme. The CGPA is computed by dividing the total number of credit points by the total number of units for all the courses taken in the semester. The CGPA is used in the determination of the class of degree as summarized in Table 1 below. The CGPA shall be calculated and expressed correctly to two decimal places.

Table1: Degree Classification

CUMULATIVE GRADE POINT AVERAGE (CGPA)	CLASS OF DEGREE
4.50 - 5.00	First Class (Hons)
3.50 - 4.49	2nd Class (Hons) Upper
2.40 - 3.49	2nd Class (Hons) Lower
1.50 –2.39	3rd Class (Hons)
1.00 –1.49	Pass

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

12.0 MISCELLENEOUS

12.1 Departmental Interaction

At the start of the year, you will be assigned a personal lab supervisor, tutor, and academic adviser. You should make every effort to keep him/her informed of any issues that may affect your studies. If there are matters which you feel you cannot discuss with your tutor/ adviser you may approach any other member of staff in confidence. If you encounter any problems then please contact the Head of Department.

12.2 Female Student Contact Person

Female students, who wish to seek assistance or advice on gender issues should see any of the female lecturers.

12.3 Disability

There is a wide range of support services for students with disabilities covering accommodation, access, finance, examinations, etc. find out from

your academic advisers.

If you have an illness or injury during the examination period that may affect your ability to perform in the examination you should contact the EEE Departmental Examinations officer as

soon as possible, to determine what special arrangements need to be made for you to sit the examination.

12.4 Departmental Engineering Society

The Association of Computer Engineering Students or ACOMPES for short is run solely by CEE Departmental Students. No previous experience is required for positions of responsibility within the association. The society mainly concentrates on the social aspects of the department by organizing activities that enhance personal growth and fellowship. Various sports events are arranged throughout the year by the sports unit of the university including football league, intermural competitions, etc. In addition to these social activities, we periodically arrange industrial trips and for guest speakers to come and talk to us about topics of interest, with the help and support of the Department.

12.5 University Transferred Students

Students who transfer from other Universities shall be credited with only those courses deemed relevant to the programme, which they have already passed prior to their transfer. Such students shall however be required to pass the minimum number of units specified for graduation for the number of sessions he/she has spent in the Department; provided that no student shall spend less than two sessions (4 semester) in order to earn a degree. Students who transferred for any approved reason shall be credited with those units passed that are within the curriculum. Appropriate decisions on transfer cases shall, be subject to the approval of Senate on the recommendation of the Faculty and Department