OSUN STATE UNIVERSITY, OSOGBO

COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENTAL HANDBOOK

MAY, 2025

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PREFACE

On behalf of the Faculty of Engineering, I congratulate and welcome our fresh and returning students to Osun State University, Osogbo. You have joined the ranks of a prestigious group who have chosen the right environment to develop a very rich and solid career in Engineering. Modern education requires modern system and innovative approach to teaching, research and learning. Electrical and Electronic Engineering is fast-evolving in challenging environment with a view to proffering solutions to global challenges in products design, societal technological needs and manufacturing industries. The expectations from graduate Electrical and Electronic engineers are enormous and require the contribution of the academics and the society to meet up with the necessary tools and conducive environment for teaching and learning.

Electrical and Electronic Engineering is designed to bridge the gap between Engineering and Sciences as well as between academics and industries including manufacturing, power generation, telecommunication, industrial process control and automations. Electrical and Electronic Engineers all over the world are playing leading roles in the current search for alternative and renewable energy generation, development of new process routes and process equipment which will be eco-friendlier with adaptive control in real time. Graduates of Electrical and Electronic Engineering will fit into both the conventional and modern artificial intelligent based systems in both process and manufacturing industries. They will possess the knowledge and skills needed to design new products, generate energy through renewable sources, develop modern communication tools while making efforts to make existing communication architecture fast, and devoid of interference, attenuation and noise free. The programme in Electrical and Electronic Engineering is therefore designed to produce engineers that can meet the challenges in the afore-mentioned areas through service in governmental agencies/establishments, public and private process industries.

Electrical and Electronic Engineering graduates are currently required to take on the challenges confronting the world in the areas of system automation, improved products, novel design of systems and processes, power and energy generation, electronic and artificial intelligence in food and animal production, improved information and communication system, surveillance, intelligent monitoring and security. Achieving these goals, the programme of Electrical and Electronic Engineering is birthed to produce competent and competitive graduates that will give necessary solutions to Nigeria nation, Africa countries and the world, at large. The department and practice of Electrical and Electronic Engineering is ever ready to engage the world at every critical juncture in developing necessary invention for novel productions in residential, commercial and industrial applications and so on.

This handbook will therefore be a guide to all our students as indicated in the departmental curricula. Apart from the academic exposure the students will receive while on the campus here, we are committed to raise a God-fearing generation of good moral standard that will be beacons of light wherever they find themselves after graduation. The Faculty is blessed with very committed staff, who have made their marks in the Engineering profession.

I wish you all a very successful career during your stay in the Faculty and God's abundant blessings in all your endeavors.

Dr A.L. Adejumo
Ag. Dean, Faculty of Engineering
Osun State University, Osogbo

FOREWORD

It is with great pleasure and a sense of pride that I introduce the Departmental Handbook of Electrical and Electronic Engineering at Osun State University, Osogbo. This handbook serves as a compass for our students and a testament to our commitment to providing a high-quality educational experience in the field of Electrical and Electronic Engineering.

Electrical and Electronic Engineering is the cornerstone of modern society, playing a crucial role in shaping the future of technological advancement, energy sustainability, infrastructure development, and economic growth. The Department of Electrical and Electronic Engineering at Osun State University is dedicated to nurturing the next generation of engineers, innovators, and leaders who will drive progress in these critical areas.

This handbook is designed to be your companion throughout your academic journey. It offers insights into the history, vision, mission, and objectives of our department. It outlines essential academic regulations and provides a comprehensive list of courses required for the award of a Bachelor of Engineering (B.Eng.) degree in Electrical and Electronic Engineering.

As we look to the future, the role of electrical and electronic engineers becomes increasingly vital in a world that relies on smart technologies, renewable energy, automation, and digital communication. We are committed to equipping our students with the knowledge and skills needed to address the complex challenges facing industries and society. Our programs are designed to be dynamic and responsive to the evolving technological landscape, and our curriculum aligns with national and international standards to ensure that our graduates are well-prepared to make meaningful contributions in their chosen fields.

In an era where innovation drives progress, we believe that our graduates will be at the forefront of groundbreaking discoveries and transformative solutions. As you embark on your academic journey with us, I encourage you to make the most of the resources and opportunities provided by our department. I extend my appreciation to the dedicated faculty and staff who work tirelessly to create an enriching learning environment. Together, we are committed to supporting your academic and personal growth.

I hope you find this handbook informative, inspiring, and helpful in navigating your path through the Department of Electrical and Electronic Engineering at Osun State University. Your success is our success, and we look forward to witnessing your growth and contributions to the field of electrical and electronic engineering. Welcome to a world of knowledge, innovation, and endless possibilities. We wish you a rewarding and transformative academic experience.

Prof. Moruf O. Olayiwola

Provost, College Science, Engineering and Technology

Osun State University, Osogbo

CHAPTER ONE

GENERAL INTRODUCTION

1.1 Brief History Of Electrical and Electronic Engineering Department

The Department of Electrical and Electronics Engineering is one of the two pioneer departments in the Faculty of Engineering under the College of Science, Engineering and Technology of Osun State University. Academic activities commenced in very first session (2007/2008) of the establishment of the University. The Department runs a 5-year undergraduate programme leading to the award of the Bachelor of Engineering (B. Eng.) degree in Electrical and Electronics Engineering.

The academic programme of the Department operates academic curricula that is tailored along the stipulations contained in the Benchmark Minimum Academic Standards (BMAS) of the National Universities Commission (NUC) and the BMAS of the Council for the Regulation of Engineering in Nigeria (COREN). The curriculum exposes Students to basic knowledge, best practices and current advances in the field of Electrical and Electronics Engineering as well as entrepreneurial and industrial training with a view to enabling them to be arrow heads of the technological development of Nigeria while also being globally competitive. In their final year, Students can concentrate in any of the following;

i. Power and Machines

ii. Electronics and Telecommunications

iii. Computer and Control Engineering.

The Department enjoys modern communication and information technology facilities available in the University and these are judiciously utilized for teaching and research. The first set of students graduated from the Department of Electrical and Electronic Engineering at the end of the 2011/2012 academic session.

1.2 Vision of the Department

The Department aspires to be a centre of excellence providing high quality teaching, learning and exposure to industrial experiences in Electrical and Electronic Engineering that will engender the production of entrepreneurial and excellent professionals, graduates that satisfy immediate industrial and community manpower while being globally competitive.

1.3 Mission of the Department

The mission of the department is to create a teaching and research environment through engaging the students in cutting edge researches that will advance frontiers of knowledge, bring inventions into Electrical and Electronic Engineering practices and to pursue academic excellence.

1.4 Philosophy of the Department

The Philosophy of Electrical and Electronics Engineering programme of Osun State University is to train students and produce graduates with high academic standards and adequate practical background in Electrical and Electronics Engineering through broad-based

training and exposure to industrial as well as entrepreneurial practices to enable them satisfy the immediate manpower needs of the industry and the community.

1.5 Aims and Objectives of the Programme

The specific objectives of the programme are to:

i. provide broad based academic and practical training to achieve mastery in Electrical and Electronics Engineering concepts;

ii. provide a wide range of quality learning opportunities for students in Electrical and Electronics Engineering without distinction of race, creed, sex, religious or political conviction such that will enhance their best intellectual, social and personal development;

iii. provide professional and vocational training of high quality with industrial exposures in Electrical and Electronics Engineering, in such a way as to enrich and improve the state, national and international human resources capabilities and assist its graduates to contribute to the common good of society;

iv. train individuals in the standard engineering practices as applicable to the modern techniques; formulating solutions to the various industrial, manufacturing, and service delivery problems prevalent in our society;

v. foster academic research in Electrical and Electronics Engineering, which contributes to human knowledge and the vitality of the institution;

vi. evolve academic programmes in Electrical and Electronics Engineering to suit the changing social and economic needs of society through continuous review of curricula and development of new programmes to respond to societal and technological changes in Osun State in particular, Nigeria and the world in general.

vii. appraise students based on their limitations and potentials and to make real efforts in provision of relevant compensation/measures.

1.6 Programme Educational Objectives (PEOs)

The requirement for the program educational objectives (PEO) for engineering programmes was embedded into the Benchmark for Minimum Academic Standard (BMAS) of the regulatory agency for engineering education in the year 2017, and subsequently the Faculty of Engineering at Osun State University formulated hers and was approved by the University Senate.

It describes the expectations of our graduates after a few years of work experience by contributing to the society through modern technologies and practices. It aims to enable suitably qualified graduates from a range of engineering backgrounds to:

i. **PEO1 -KNOWLEDGE:** access high quality teaching and learning experiences in mathematics, science, engineering fundamentals and an engineering specialization to the solution of developmental and complex engineering problems;

ii. **PEO2 -RESEARCH:** 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;

iii. **PEO3 -ENTREPRENEURIAL SKILLS:** have entrepreneurial skills that can make them stand on their own as job creators, to provide the engineering industry and profession globally, with readily employable and enterprising graduates prepared for the assumption of technical, managerial and financial responsibilities.

iv. **PEO4 -PROFESSIONALISM AND TEAMWORK:** execute and manage teamwork, interpersonal skills and professional growth and be able to conduct professional practice considering societal, ethical, and environmental aspects.

v. **PEO5** – **INVENTION AND CREATIVITY**: apply the acquired knowledge and skills in Electrical and Electronic engineering to develop innovative and sustainable solutions for global competitiveness.

1.7 Programme Outcomes (POs)

The programme outcomes are presented below:

i. **PO1** **Engineering knowledge -** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of developmental and complex engineering problems

ii. **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.

iii. **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

iv. **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.

v. **PO5** **Modern Tools 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.

vi. **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

vii. **PO7** **Environment & Sustainability** - Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development

viii. **PO8 Ethics** - Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice, including adherence to the COREN Engineers Code of Conducts.

ix. **PO9 Individual & Team Work** - Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

x. **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.

xi. **PO11 Project Management & Finance** - 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

xii. **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

Table 1.1: Mapping of PEOs to University and Departmental Vision and Mission

Vision and Mission		**Program Educational Objectives (PEOs)**				
		PEO- 1	**PEO- 2**	**PEO- 3**	**PEO- 4**	**PEO- 5**
University Vision	To be a centre of excellence, providing high quality teaching and learning experience which will engender production of entrepreneurial graduates capable of impacting positively on their environment while being globally competitive	■	■	■	■	
University Mission	To create a unique institution committed to the pursuit of academic innovation, skill-based training and a tradition of excellence in teaching, research and community service.	■	■	■	■	

Department Vision	The Department aspires to be a centre of excellence providing high quality teaching, learning and exposure to industrial experiences in Electrical and Electronic Engineering that will engender the production of entrepreneurial and excellent professionals, graduates that are capable of impacting on their environment while being globally competitive.	■	■	■	■	
Department Mission	The mission of the department is to create a teaching and research environment through engaging the students in cutting edge researches that will advance frontiers of knowledge, bring inventions into Electrical and Electronic Engineering practices and to pursue academic excellence.	■	■	■	■	

CHAPTER TWO

REGULATIONS GOVERNING THE CONDUCT OF EXAMINATIONS

2.1 Semester Examinations

Examinations are administered at the end of each course, which is usually at the end of the Harmattan and Rain Semesters. Continuous assessment conducted for students by means of term papers, frequent tests (formal and informal), assignments, assessments in workshop/ laboratory/ studio/ field/clinic/exhibition, carry 30% of the total scores for the examinations conducted. A minimum pass mark of 40% (equivalent to grade point of 1) is used in the Department. A student who scored below 40% in a course will be deemed to have failed the course and will be required to retake the course at the next available opportunity. Failed courses which students retake and pass will be credited with the full marks so earned.

Students who are unable to participate in any examination on account of ill-health or for other genuine reasons may, by the approval of the University Senate, be allowed to sit for the examination for the course at the next available opportunity without penalty. For quality assurance, 500 level question papers are moderated by the University appointed external examiner while the HOD oversees the quality of question papers in general.

i. Eligibility

All students who are duly registered for courses in a given semester are eligible to sit for examinations in those courses except students who were absent from the University for upward of six weeks without official permission or students who fail to attend up to 70% of any practical/lectures in a theoretical course.

ii. Instructions to Candidates

Students must ensure that they acquaint themselves with the instructions governing Examinations as contained in the Students' Information Handbook/front page of examination answer booklets.

Candidates must attend punctually at the time scheduled for their papers and should be within the vicinity of the examination venue at least 30 minutes to the commencement of the examination. Candidates arriving later than half an hour after the examination has started shall be admitted only at the discretion of the Chief Invigilator.

Candidates must bring with them to the examination hall their own ink, pen, ruler, eraser and pencils and any materials which may be permitted by those regulations (as stated here-under) but they are not allowed to bring any other books or papers. Candidates are warned in their own interest to ensure that *lecture notes, text-books, jotters, handsets, bags, etc.* are not brought anywhere close to the examination hall.

No student will be allowed into the examination hall without the identity card. The University identity card must be displayed on the table while the examination is in progress.

Invigilators may search candidates before admission into the examination hall.

- To ensure orderliness in the examination hall, seats will be arranged according to the number of groups taking examinations at each particular time and *candidates are not expected in the hall earlier than 10 minutes to the commencement of each examination. They are also advised to keep strictly to the seating arrangements to avoid confusion. Chairs arranged in halls used for examination purposes should not under any circumstances, be removed by any candidate.*

- While the examination is in progress, *communication of any kind between candidates is strictly forbidden*, and any candidate found to be giving or receiving irregular assistance may be required to withdraw from the examination.

- *Silence must be observed in the examination hall*. The only permissible way of attracting the attention of the Invigilator by any candidate is to signify by raising his/her hand.

- Smoking in the examination hall is *strictly prohibited*.

- *The use of scrap paper is not permitted. All rough work must be done in the answer booklets, crossed out neatly afterwards and submitted along with the answer booklet.*

- *The answer to each question must be started on a fresh page on the answer booklet.*

- Candidates taking Mathematics or Engineering Drawing and similar courses must not bring their own mathematical of drawing instruments. Personal copies of Mathematical Tables will not be allowed in the examination hall.

- Candidates must use their matriculation numbers for the examination.

- Before handling in their scripts at the end of the examination, candidates must satisfy themselves that they have inserted at the appropriate places their matriculation numbers and the numbers of the questions answered. Except for the question paper and any other materials, they may have legitimately brought with them (as indicated above), candidates are not allowed to remove or mutilate any paper or materials supplied by the University.

- Candidates must not leave the examination hall in the first 30 minutes and the last 15 minutes of any examination. Candidates permitted by the invigilator to leave the examination hall temporarily should be accompanied by an attendant.

- Candidates must remain seated while invigilators go from row to row to collect answer scripts.

- ❖ Candidates are required to sign against their matriculation and answer booklet numbers on the attendance sheet.
- ❖ Students permitted to use calculators in University examinations shall use only electronic calculators and not programmable ones (with or without external stores). The calculator must be small (hand-held) and battery operated.
- ❖ A candidate must not borrow another candidate's calculator during the examination, as this practice might be construed as giving or receiving irregular assistance during the examination.
- ❖ Responsibility for the correct operation of the machine rests with the candidate alone and no account will be taken of the machine failure.
- ❖ Instruction manuals are forbidden (as these often contain useful mathematical formulae and methods). Calculator packets and containers are also forbidden in examination halls. Invigilators and Examination Assistants have been requested to remove them whenever and wherever they are discovered in the examination halls, rooms/laboratories.
- ❖ Only one calculator per student is allowed and the calculator must be switched off on entry to the examination room.
- ❖ Candidates shall make available for inspection by invigilators, their calculators on entry into the examination hall and at any time during the examination.
- ❖ Candidates should know that the contravention of any of these regulations will be treated in the same way as "cheating" in an examination.

iii. Examination Misconduct

- ➢ Candidates shall use or consult, during an examination only such books, papers, instruments or other materials or aids as are specifically permitted or provided by the Department in which the examination is being held.
- ➢ Candidates shall not introduce or attempt to introduce handbags, books, notes, instruments, handsets or other materials or aids into the examination room.
- ➢ Candidate shall not pass or attempt to pass information from one person to another during an examination.
- ➢ Candidates shall neither act in collusion with any other candidate or person, nor copy nor attempt to copy from another candidate nor engage in any similar activities classified as examination offences.
- ➢ Candidates shall not disturb or distract the attention of any other candidate(s) during examination.

- Candidates shall not engage in the following examination related offences which prejudice the integrity of the University Examination:
    - Submission of answer script with different handwritings
    - Abuse of examination procedures and ethics
    - Possession of valid question papers prior to the examination period (leakage)
    - Smuggling out question papers while the examination is in progress
    - Cheating while the examination is in progress
    - Exchange of answer sheets between students
    - Exchange of question papers on which answers have been written by students
    - Impersonation and hire of examination mercenaries
    - Copying from notes, scraps of paper, prepared answers, textbooks, handsets and fellow students
    - Smuggling in prepared answers on handkerchiefs, examination stationery, part of the body, etc.
    - Getting help in dishonest ways
    - Discussions among students in the examination hall while the examination is in progress
    - Rowdy climate of examination venue
    - Submission of scripts without registration of student on the attendance list
    - Registration of students on the attendance list without submission of script
    - Refusal to complete the examination malpractice form after involvement in a malpractice
    - Insubordination or failure to obey invigilator's instructions during the examination
    - Refusal to appear before the Examination Malpractices Panel
    - Assault/battery/harassment of co-students for non-cooperation in examination malpractice
    - Giraffing/spying on another candidate in the exanimation hall

iv. Application of Sanctions/Disciplinary Actions

Each of the previously listed offences will attract ascending sanctions i.e., warning, interdiction, suspension of the culprit for one to four semesters, expulsion as may be deemed appropriate by the Examination Malpractices Panel.

Staff complicity in any of the above listed offences will attract the sanction of suspension for three (3) months without salary or dismissal as deemed appropriate.

Any candidate found cheating or aiding and abetting cheating in any examination and who has not previously committed such an offence shall be rusticated for one semester or one academic year. In addition, the result of such an examination shall be declared nullified for any candidate found guilty of cheating. Student so rusticated shall be barred from examinations which fall during the period of rustication.

At the end of the period for which he has been rusticated, a candidate penalized as above may thereafter resume his studentship/study at the appropriate point in the following semester.

A candidate penalized as stated above who afterwards is found guilty of cheating a second time shall be dismissed from the University.

v. Absence from Examinations

Candidates must present themselves at such University Examinations for which they have registered under these Regulations. Candidates who fail to do so for reasons other than illness or accident or exceptional cases, shall be deemed to have failed that examination. Misreading of the Time-Table and such lapses on the part of the candidates shall not be accepted as a satisfactory explanation for absence.

A student who falls ill during an examination should report in writing to the Provost of his or her College. A student who is absent from an examination on account of illness confirmed by medical evidence from the Director of University Health Centre shall take the regular examination on the following occasion without penalization. Approval of such shall be by the Senate on the recommendation of the College Board.

2.2 Merit standard system for students

i. Merit Standard System

Students registered in the Department are expected to be of good behavior and adhere strictly to the rules and regulations governing their studentship, and abide by contents of the matriculation oath which they signed.

The University has approved a Merit Standard System to assess the behavior of students during their studentship.

Using this System, a student is credited with 70 points at the commencement of his studentship. Offences committed as listed below attract deductions from the 70 points down to a minimum of 39 points.

Any student who runs down to 45 points is issued a warning through calls and the parent notified of the likely suspension of their wards.

At 39 points a student earns a suspension for a semester. Upon resumption, the student is credited with fresh 70 points, which is also deductible as stated above.

Subsequent infractions of the University regulations will attract suspension for additional two (2) semester and further infractions will lead to expulsion.

The countdown demerit system is categorized as follows:

a)	Indecent Dressing	C
b)	Sexual Harassment	A (physical) or B (verbal)
c)	Class Attendance	A
d)	Rudeness to Officials (verbal)	A+ (physical) or B
e)	Inducement for Favours	B
f)	Violence (mild)	A+ (bothering on life)/A
g)	Encouragement of Violence	B
h)	Disruption of Official/Academic Activities	B
i)	Criminal Activities (**Theft, Rape, Assault,**	A+
	Affray, Possession of arms, Impersonation	A+
	or Forgery of Documents)	A+
j)	Fighting	A+
k)	Examination Malpractice	A+
l)	Destruction of University Property	A
m)	Cultism	A+
n)	Prostitution	A+

Where;

A+ = 31 points

A = 10 points

B = 7 points

C = 5 points

ii. Indecent Dressing

Students are expected to be properly dressed and any dressing considered indecent may attract some degree of sanctions. Indecent dressing includes the following:

a) Tattered Jeans

b) Patterned/Flowered Jeans

c) Loose Ties

d) Open or Folded Sleeves

e) Jumpy tops

f) Micro-mini skirts

g) Sleeveless Tops

h) Low-necked Tops

i) Baggy shorts/Dungarees

j) Heavy Jewelries

k) Flying Shirts

l) Slippers (except on Fridays and not bathroom slippers)

m) Ankle Chains

n) Nose/Mouth/Eye/Extra ear rings

o) Earrings for boys

p) Afro hair for boys

q) “Sagging”/”Dropping” of trousers and skirts

r) Transparent wears

s) Other observable indecent appearance such as hair braiding for males, etc.

CHAPTER THREE

ACADEMIC REGULATIONS

3.1. Admission Requirements

The Department of Electrical and Electronic Engineering has academic regulations that are designed to assist students to maintain their studentship and understand the requirements for the award of degrees in the University.

3.1.1 UTME Entry

In addition to the general entry requirements of the University, an intending candidate must possess at least five (5) credit passes in SSCE or NECO (O' Level), obtained at not more than two sittings, which must include the following subjects: English Language, Mathematics, Physics, Chemistry and any one of Biology/Agricultural Science/Further Mathematics/Technical Drawing. Candidates with acceptable passes in the Pre-Degree Programme of the Osun State University and that have an acceptable pass in the UTME may also be admitted into the 5-year degree programme.

3.1.2 Direct Entry

Candidates with passes at the Advanced Level (A-Level) in relevant subjects, which must include Mathematics, Physics and Chemistry and those with OND (Upper Credit) and HND (minimum of lower Credit) in relevant Science-Based or Engineering Courses from any higher institution recognized by the University Senate may be admitted into the 200-level, provided such candidates fulfill the UTME admission requirements of the Department.

3.2 Duration of the programme

The duration of the programme is five sessions, that is,

-10 semesters for UTME candidates

-8 semesters for Direct Entry candidate.

3.3 Admission and graduation policy

3.3.1 Admission

For admission into any of the first-degree programmes of the Osun State University, a candidate shall be required to meet the Faculty and Departmental admission requirements as stipulated in the individual Faculty and Departmental Handbooks. In addition to the Faculty requirements, the candidate should possess the following minimum qualifications:

(i) A candidate for admission into the 100 level must have the Senior Secondary School Certificate (SSCE) or its equivalents with credit level passes in five (5) subjects at not

more than two sittings. The candidate must also earn an acceptable score in the Joint Admissions and Matriculation Board's University Tertiary Matriculation Examination (UTME).

(ii) Candidates seeking admission by direct entry into the 200 level must have two (2) Advanced Level passes or approved equivalents in relevant subjects in addition to the minimum requirements of credit level passes at the SSCE or its equivalents in five subjects at not more than two sittings.

In all admissions into the University, credit level pass in English Language is required. In addition, credit level pass in Mathematics is required for all science- based, Social Sciences and Management Science courses.

3.3.2. Post-UTME Screening

Candidates seeking admission into the University irrespective of their UTME scores are required to pass the University post-UTME screening before being admitted.

3.3.3 Duration of Degree Programmes

The minimum number of years to be spent to be awarded a first degree in a programme of study in non-professional area in the university is four years (or three years minimum for direct entry candidates), and shall not exceed an additional 50% of the duration of the programme if the student fails to graduate within the minimum number of years. The minimum number of academic sessions required for award of the B.Eng. degree in Electrical and Electronic Engineering shall be five academic sessions for UTME candidates and four for direct entry candidates. The maximum duration allowable for UTME candidates shall be seven academic sessions while direct entry candidates shall not spend more than six academic sessions.

3.3.4 Graduation Requirements

To qualify for the award of a degree of the Osun State University**,** a student is required to have:

(i) Completed and passed the prescribed number of units including all compulsory courses specified by the University.

(ii) Completed and met the standards for all required and optional courses

(iii) Obtained the prescribed minimum CGPA.

The graduation requirements for the different honours' degree programmes are as contained in the individual Departmental Handbooks.

3.3.5 Probation, Expulsion, Withdrawals

i. Probation

To be in good standing, a student must maintain a cumulative grade-point average (CGPA) of not less than 1.50 at the end of any semester during his/her study in the University. A student whose CGPA is below 1.50 at the end of a semester, goes on probation during the following semester.

ii. Withdrawal

A student will lose studentship and be required to withdraw from the University if at the end of any probation his/her CGPA is still below 1.50. Also, listed for withdrawals are students that have spent the maximum period of study allowed for his/her programme of study and still has one or more courses outstanding.

iii. Expulsion

A student may be expelled for violation of the Matriculation Oath, violation of the Code of Conduct or if found guilty of criminal behaviour. The Vice-Chancellor and Senate are vested with powers to deal with student misconduct and mete out appropriate sanctions. Students accused of misconduct are required to appear before the Student Disciplinary Committee that advises the Vice-Chancellor. Any student who has been so punished has a right to appeal to Council.

3.4 Grading System and Requirements for Graduation in each programme

Describe the grading system used in the evaluation of students and the requirements for graduation in a degree programme. Also explain how repeats in final examinations are handled.

3.4.1 Evaluation of Students

Students' performances in the various courses are assessed as follows:

- Practical oriented Courses.

(i)	Final theory Examinations	:	70%
(ii)	Final Practical Examination		10%
(iii)	Class work Practical (Lab, W/shops:		
Studio, Assignments, Quizzes)			20%
			100%

- Non-Practical Oriented Courses

(i)	Final theoretical Examinations	70%
(ii)	Course Work (Quizzes, Assignments,	
	Terminal paper etc)	30%

100%

- Purely practical Courses

i) Continuous Assessment 50%

ii) Practical Examination 50%

100%

3.4.2 Grading System

Osun State University ensures the use of common assessment scale and grading system for all courses taught under the course unit system in the University. The grading system is as indicated in the table below:

Table 3.1. The grading system

Percentage Scores	Letter Grade	Quality Point	Level of Achievement
70-100	A	5	Excellent
60-69	B	4	Very Good
50-59	C	3	Good
45-49	D	2	Satisfactory
40-44	E	1	Pass
0-39	F	0	Fail

Table 3.2. Cumulative Grade Point Average (CGPA) is used to determine the level of the final pass grade obtained by a student in all programmes in the university as follows:

Cumulative Grade Point Average (CGPA)	**Class of Degree**
4.50-5.00	1st Class Honours
3.50-4.49	2nd Class Honours Upper Division
2.40–3.49	2nd Class Honours Lower Division
1.50–2.39	3rd Class Honours

3.5 Staff Profile

Table 3.3 Academic Staff List

S/N	NAME OF ACADEMIC STAFF	AREA OF SPECIALIZATION	QUALIFICATION /COREN	RANK
1.	Dr. O. Oladepo	Power Systems, Energy Storage	PhD, Elect Elect Eng M.Eng, B.Tech (R 23235)	Senior Lecturer
2.	Prof. T. O. Ajewole	Power Systems, Microgrid	PhD, Elect Elect Eng M.Sc., B.Sc., (R 22174)	Professor
3.	Prof. G. A. Ajenikoko	Power Systems	PhD. Elect Elect Eng M.Eng. B.Eng (R10355)	Professor
4	Prof. A.A Bello	Geotechnical Engineering	PhD Civil Engineering. MSc. B.Tech (R14823)	Professor
5.	Dr. H. O. Lasisi	Telecommunication	PhD. Elect Elect Eng, M.Eng. B.Eng (R21879)	Associate Professor
6.	Dr. M. O. Lawal	Power Systems	PhD Elect Elect Eng M. Eng. B.Tech (R 27237)	Associate Professor
7.	Dr. K. O. Alawode	Control Engineering	PhD Elect Elect Eng M. Eng. B.Tech (R 26852)	Senior Lecturer
8.	Dr. T. T. Awofolaju	Communication Engineering	PhD Elect Elect Eng M. Eng. B.Tech (R26918)	Senior Lecturer
9.	Dr. S. I. Ojo	Communication Engineering	PhD Elect Elect Eng M. Tech. B. Tech (R 42451)	Senior Lecturer
10.	Dr. A.P Adeagbo	Power Systems	PhD Elect Elect Eng. M. Eng. B. (R44972)	Senior Lecturer
11.	Dr. B.S. Adeboye	Machine Design/Renewable Energy	PhD Mech. Eng. M. Eng. B.Sc. Agric Eng. (R32407)	Senior Lecturer
12.	Engr. O. M. Bada	Control Engineering	M. Eng Elect Elect	Lecturer I

			Eng. B.Eng (R61150)	
13.	Dr. A. A. Olawuyi	Power Systems	PhD Elect Elect Eng M.Eng B.Eng (R72154)	Lecturer I
14.	Dr. M. O. Olla	Communication Engineering	PhD Elect Elect Eng. M.Eng, B. Eng (R61808)	Lecturer I
15	Dr T. F. Oyewusi	Environmental Engineering	PhD Environmental Eng M.Eng, B.Eng (R41221)	Lecturer I
16.	Engr F. M. Adeagbo	Communication Engineering	M. Eng Elect Elect Eng. B.Tech (R60174)	Lecturer II
17.	Engr. B. F. Aderinkola	Communication Engineering	M. Eng. Elect Elect Eng. B.Eng (R62652)	Lecturer II
18	Engr. R.G. Lateef	Power Systems	M. Eng Elect Elect Eng, B.Eng (R75545)	Lecturer II
19	Engr. Mrs A. R Olaniyan	Farm Power	M.Eng. Agric Eng. B.Eng (R72949)	Lecturer II

Table 3.4 Technical Staff

S/N	**NAME**	**Area of Specialization**	**Qualification/ COREN**	**DESIGNATION**
1.	Mrs. B.M. Ojuola,	Power Systems	M. Eng, B. Eng HND (R4914ET)	Assistant Chief Technologist
2.	Mr. A.O. Esho	Electronics	BSc, HND, (NISLT A 5588)	Assistant Chief Technologist
3	Engr. Agelebe O. G.	Instrumentation and Control	B. Eng HND, OND Elect Elect Engineering (COREN Reg. 78899)	Technologist II
4.	Mr S. O. Olatona	Telecommunication	HND, OND Elect Elect Engineering (R8283ET)	Technologist II
5.	Mrs O. R. Olowu	Telecommunication	PGD, HND OND (NATE Reg.) Elect Elect Engineering	Technologist II

6.	Mr. I. O. Ojomuyiwa	Computer Engineering	M.Tech. (Computer Engineering) PGD Computer Engineering BSc Computer Science	Technologist II
7.	Mr I. O. Bello	Power Systems	HND,OND Elect Elect Engineering	Technologist II
8.	Mr. A.K. Wahab	Power Systems	HND, OND Elect Elect Engineering	Technologist II

Table 3.5: Administrative Staff

S/N	NAME	QUALIFICATION	DESIGNATION
1.	Mrs A. O. Yekinni	ND (Office Technologist & Management)	Confidential Secretary
2	Mrs B. E. Samson	O'Level	Supervisor
3	Miss J.D. Aderinwale	Bsc. Sociology	Corps Member

CHAPTER FOUR

LIST OF COURSES REQUIRED FOR THE AWARD OF BACHELOR OF ENGINEERING (B.Eng.) DEGREE IN ELECTRIC AND ELECTRONIC ENGINEERING. THE UNIVERSITY HAS ADOPTED THE BMAS ON

All different options are stated in the curriculum where a student will offer all courses in all the options from 100 level to first semester in 500 level during his/her programme.

A student will select courses from his/her option in the second semester of 500 level.

All courses are compulsory courses for all the students in the levels as stated above.

In second semester of 500 level, the options are:

A. ELECTRICAL POWER AND MACHINE
B. ELECTRONIC AND TELECOMMUNICATION
C. CONTROL AND INSTRUMENTATION

4.1 Schedule of Courses

100 LEVEL HARMATTAN SEMESTER

COURSE CODE	COURSE TITLE	PRE-REQUISITE	UNITS	STATUS
MEE 101	Engineering Drawing I		2	C
CVE 101	Engineer in Society		2	C
CHM 101	General Chemistry I		3	C
CHM 107	Experimental Chemistry I		1	C
MTH 101	General Mathematics I (Algebra & Trigonometry)		3	C
PHY 101	General Physics I		3	C
PHY 107	Experimental Physics I		1	C
GNS 101	Use of English I		2	R
GNS 103	Use of Library		1	R
TOTAL		**18 Units**		

100 Level Rain Semester

COURSE CODE	COURSE TITLE	PRE-REQUISITE	UNITS	STATUS
MEE 102	Engineering Drawing II	MEE 101	2	C
MEE 104	Workshop Technology I		2	C
CHM 102	General Chemistry II		3	C
CHM 108	Experimental Chemistry II		1	C
MTH 102	General Mathematics II (Calculus)	MTH 101	3	C
MTH 104	General Mathematics III (Vector, Geometry & Dynamics)	MTH 101	3	C
PHY 102	General Physics II		3	C
PHY 108	Experimental Physics II		1	C
GNS 102	Use of English II		2	R
GNS 104	Nigerian Peoples & Culture		2	R
	TOTAL	**22 Units**		

200 LEVEL HARMATTAN SEMESTER

COURSE CODE	COURSE TITLE	PRE-REQUISITE	UNITS	STATUS
EEE 201	Applied Electricity I		2	C
EEE 291	Applied Electricity Laboratory I		1	C
MEE 201	Engineering Materials		2	C
MEE 203	Engineering Mechanics I (Statics)		2	C
MEE 207	Basic Thermodynamics		3	C
EEE 231	Engineering Mathematics I	MTH 101, MTH 102, MTH 104	3	C
STA 221	Statistics for Physical Sciences and Engineering		3	C
CSC 201	Structured Programming		3	C
GNS 211	Basic French		2	R
GNS 203	Introduction to Entrepreneurial Skills		2	R
	TOTAL	**23 Units**		

200 LEVEL RAIN SEMESTER

COURSE CODE	COURSE TITLE	PRE-REQUISITE	UNITS	STATUS
EEE 202	Applied Electricity II	EEE 201	2	C
EEE 292	Applied Electricity Laboratory II		1	C
CVE 206	Strength of Materials I		3	C
MEE 204	Engineering Mechanics II (Dynamics)	MEE 203	2	C
MEE 206	Basic Fluid Mechanics		2	C
MEE 208	Workshop Technology II	MEE 104	2	C
EEE 232	Engineering Mathematics II	EEE 231	3	C
EEE 210	Introduction to Electrical and Electronics Engineering		2	C
GNS 212	Introduction to Information and Communication Technology		2	R
GNS 204	Logic and Philosophy		2	R
	TOTAL	**21 Units**		

EEE 200 SWEP I – Vacation Period (8 weeks)

300 LEVEL HARMATTAN SEMESTER

COURSE CODE	COURSE TITLE	PRE-REQUISITE	UNITS	STATUS
EEE 313	Electronic Circuits I	EEE 201	3	C
EEE 315	Electrical Machines I	EEE 201	3	C
EEE 317	Use of Engineering Software Packages		2	C
EEE 319	Mini Project I		2	C
EEE 321	Electric Circuit Theory I	EEE 201	3	C

EEE 323	Electromagnetic Fields and waves I	EEE 202	3	C
EEE 331	Engineering Mathematics III	EEE 231, EEE 232	3	C
EEE 381	Electrical & Electronics Laboratory Course I		2	C
TOTAL 21 UNITS				

300 LEVEL RAIN SEMESTER

COURSE CODE	COURSE TITLE	PRE-REQUISITE	UNITS	STATUS
EEE 308	Digital Circuit Analysis and Design	EEE 202	3	C
EEE 310	Measurement and Instrumentation	EEE 201, EEE 202	3	C
EEE 314	Electrical Machines II	EEE 315	3	C
EEE 316	Applied Computer Programming	CSC 201	2	C
EEE 318	Electric Circuit Theory II	EEE 321	3	C
EEE 320	Electronic Circuits II	EEE 313	3	C
EEE 332	Engineering Mathematics IV	EEE 331	3	C
EEE 382	Electrical & Electronics Laboratory Course II	EEE 381	2	C
TOTAL 22 UNITS				

EEE 300 SWEP II – Vacation Period (8 weeks)

400 LEVEL HARMATTAN SEMESTER

COURSE CODE	COURSE TITLE	PRE-REQUISITE	UNITS	STATUS
EEE 401	Electric Power Principles	EEE 315	3	C
EEE 407	Introduction to Control Engineering	EEE 316	3	C
EEE 413	Digital Electronics	EEE 320, EEE 308	2	C
EEE 415	Signals and Systems	EEE 201, EEE 202	3	C
EEE 417	Principles of Communication Engineering	EEE 321	3	C
EEE 421	Electromagnetic Fields and Waves II	EEE 323	3	C
EEE 423	Mini Project II	EEE 319	1	C
EEE 425	Electrical & Electronics Laboratory Course III	EEE 382	1	C
CVE 401	Technical Report Writing		2	C
TOTAL 21 UNITS				

400 LEVEL RAIN SEMESTER

COURSE CODE	COURSE TITLE	PRE-REQUISITE	UNITS	STATUS
	SWEP I	EEE 200	2	C
	SWEP II	EEE 300	2	C
EEE 400	Students' Industrial Work Experience	EEE 300	6	C

	Scheme (SIWES)			
	TOTAL UNITS		**10**	

500 LEVL HARMATTAN SEMESTER

COURSE CODE	**COURSE TITLE**	**PRE-REQUISITE**	**UNITS**	**STATUS**
EEE 501	Final Year Project I		3	C
EEE 507	Advanced Circuit Techniques	EEE 320, EEE 308	3	C
EEE 509	Control Systems Engineering	EEE 407	3	C
CVE 511	Industrial Economics		2	C
CVE 513	Industrial Law and Management		2	C
EEE 525	Power Electronics	EEE 313, EEE 401	3	C
TOTAL UNITS		**16 UNITS**		

Electives: Not less than 3 units of electives from the following:

Electronics and Telecommunications Option

EEE 527	Broadcasting and Internet Technology	EEE 417	3	E
EEE 529	Mobile and Personal Communication	EEE 417	3	E

Computer and Control Option

EEE 521	Introduction to Modern Control	EEE 407	3	E
EEE 533	Micro Computer Hardware and Software Techniques		3	E

Power and Machines Option

EEE 537	Electrical Energy Conversion and Storage	EEE 401	3	E
EEE 535	Power Systems Engineering I	EEE 401	3	E

500 LEVEL RAIN SEMESTER

COURSE CODE	**COURSE TITLE**	**PRE-REQUISITE**	**UNITS**	**STATUS**
EEE 502	Final Year Project II	EEE 501	3	C
EEE 504	Digital Signal Processing	EEE 415	3	C
EEE 510	Reliability Engineering		2	C
EEE 528	Data Communications and Networks		3	C
EEE 530	Assembly Language Programming	EEE 316	3	C
EEE 534	Design of Electrical and ICT Services		2	C
TOTAL UNITS		**16 UNITS**		

Electives: Not less than a minimum of 3 Units of electives from the following:

Electronics and Telecommunications Option

EEE 546	Digital Communication Principles	EEE 417	3	E
EEE 538	Satellite Communications	EEE 417	3	E

Computer and Control Option

EEE 540	Digital Computer Networks	EEE 415	3	E
EEE 538	System Design and VHDL Programming	EEE 316	3	E

Power and Machines Option

EEE 544	Switchgear and High Voltage Engineering	EEE 401	3	E
EEE 536	Power Systems Engineering II	EEE 401	3	E

4.2 COURSE CONTENT/DESCRIPTION

EEE 200: STUDENTS WORK EXPERIENCE PROGRAMME I (2 Units)

A practical work programme, during the long vacation, arranged within the campus and its immediate environment to enable the students gain some basic skills in the profession of engineering in general and student's chosen field of engineering in particular.

EEE 201: APPLIED ELECTRICITY I (2 Units)

Ideal Sources and Passive Components, Linear Resistive Networks, Network theorems – Kirchoff's voltage law (KVL), Kirchoff's current law (KCL), Norton, Thevenin and Superposition theorems, Non-linear Resistive Networks, Digital Abstraction, Digital Representation and Processing, Energy Storage, Elementary Discussion of Solid State Devices

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

i. Discuss the fundamental concepts of electricity and electrical DC components and circuits – Resistor, Inductor and Capacitor
ii. Explain the basic circuit laws and theorems such as Ohms Law, KVL,KCL, Thevenin, Norton and Superposition
iii. Apply circuit laws and theorems to analyze the basic DC circuit theory
iv. Describe the principles of Power and Energy in electric circuits in Digital representation and processing.
v. Illustrate the concepts of impedance and admittance in relation to DC motor and generator, and brief elementary understanding of Solid State.

EEE 202: APPLIED ELECTRICITY II (2 Units)

Magnetic field of currents in space, Time-varying Signals, Step Response of RC, RL and RLC Circuits, Impulse Response of RC, RL and RLC Circuits, Single-Phase Alternating Current circuits- complex impedance and admittance, resonant circuits, Sinusoidal Steady State Response of RC, RL and RLC Circuits, Magnetic Circuits, mutual inductances, transformers. Introduction to electrical generators and motors, Introduction to measuring instruments. ***Prerequisite: EEE201***

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

i. Explain and analyze the magnetic fields produced by two currents in space, and their interaction with electric circuits.

ii. Evaluate the step and impulse responses of RC, RL, and RLC circuits, and interpret the behavior of circuits under time-varying signals.

iii. Analyze single-phase alternating current circuits, calculate complex impedance and admittance, and explore resonance phenomena in electrical circuits.

iv. Understand the principles of magnetic circuits, mutual inductance, and transformers, and apply these concepts to solve practical electrical engineering problems.

v. Demonstrate a foundational understanding of electrical generators, motors, and the operation of basic measuring instruments used in electrical engineering.

EEE 210: INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING (2 Units)

Introduction to electrical power engineering. Introduction to communication engineering. Introduction to Control Engineering.

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

i. Explain the fundamental concepts and principles of electrical power generation, transmission, and distribution.

ii. Identify different types of power plants and describe their roles in electrical power generation and to demonstrate an understanding of power factor, efficiency, and energy conservation in electrical systems.

iii. Describe the basic components and functions of communication systems and to explain the principles of analog and digital communication, including modulation and demodulation techniques.

iv. Analyze the performance of communication systems based on signal-to-noise ratio and bandwidth, and Identify various communication media (e.g., fiber optics, satellite, wireless) and their applications.

v. Explain the basic concepts of control systems, including feedback and open-loop vs closed-loop systems and analyze first and second-order systems using time-domain and frequency-domain methods.

vi. Apply mathematical models to represent physical control systems using differential equations and transfer functions, and to demonstrate knowledge of proportional, integral, and derivative (PID) control and their applications in practical systems.

EEE 291: APPLIED ELECTRICITY LABORATORY I (1 Unit)

Laboratory experiments to demonstrate the application of the theory covered in EEE 201.
Status: Compulsory Course

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

i. Analyze and construct linear resistive networks using passive components and apply Kirchoff's Voltage Law (KVL) and Kirchoff's Current Law (KCL) to validate theoretical predictions in a laboratory setting.

ii. Experimentally demonstrate the validity of network theorems, such as Thevenin's, Norton's, and Superposition, by simplifying complex circuits and comparing the theoretical and practical results.

iii. Analyze and simulate non-linear resistive networks using diodes and transistors, evaluating their behavior under different conditions, and interpreting the effects of non-linearity in practical circuits.

iv. Design and test simple digital circuits using logic gates to explore digital abstraction, binary representation, and signal processing, verifying the functionality through experimental implementation.

v. Investigate the properties and behavior of energy storage elements, such as capacitors and inductors, and explore the basic functioning of solid-state devices like diodes and transistors in practical circuits

EEE 292: APPLIED ELECTRICITY LABORATORY II (1 Unit)

Laboratory experiments to demonstrate the application of the theory covered in EEE 202.

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

i. Demonstrate the generation and interaction of magnetic fields due to currents in space and evaluate mutual inductance between coupled coils. Conduct experiments to validate the behavior of magnetic circuits and transformer principles.

ii. Categories the step and impulse response of RC, RL, and RLC circuits in response to time-varying signals. Validate the theoretical predictions of transient behavior through experimental setups and analyze the system's damping and oscillatory behavior.

iii. Analyze experimentally single-phase AC circuits, including RC, RL, and RLC circuits, to determine complex impedance, admittance, resonance, and phase angles in the sinusoidal steady-state. Compare experimental outcomes with theoretical results.

iv. Design basic experiments on transformers, electrical generators, and motors to understand their operating principles, performance characteristics, and efficiency. Evaluate transformer step-up/step-down behavior and motor/generator inter-conversions.

v. Demonstrate Magnetic field of currents in space, Time-varying Signals, Step Response of RC, RL and RLC Circuits, Impulse Response of RC, RL and RLC Circuits, Single-Phase Alternating Current circuits- complex impedance and admittance, resonant circuits, Sinusoidal Steady State Response of RC, RL and RLC Circuits, Magnetic Circuits, mutual inductances, transformers. Introduction to electrical generators and motors, Introduction to measuring instruments.

EEE 231: ENGINEERING MATHEMATICS I (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. ***Pre-requisites MTH 101,102,104***

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

i. Apply knowledge of mathematics, science and engineering fundamentals and an engineering specialization to the solution of developmental and complex engineering problems.

ii. Identify, formulate, research literature and analyze developmental and complex engineering problems reaching substantiated conclusions using principles of mathematics, natural sciences and engineering sciences.
iii. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
iv. Demonstrate the ability to learn new technology or techniques that will be used for solving life problems and professional development activities

EEE 232: ENGINEERING MATHEMATICS II (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. ***Pre-requisites EEE 231***

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

i. Demonstrate an understanding of the properties of complex numbers and functions.
ii. Understanding the concept of mapping in the context of complex functions including conformal mappings.
iii. Formulate and solve second order differential equations to model and analyze physical systems.
iv. Identify and analyze analytic functions and apply Cauchy-Riemann equations.

EEE 300: STUDENTS' WORK EXPERIENCE PROGRAMME II (2 Units)

A more advanced industrial programme; students this time are attached, during long vacation, to appropriate Computer /Electrical / Electronics / Agricultural / Civil / Mechanical Engineering facilities and industries to further enhance practical approach to engineering through on-the job training.

EEE 308: DIGITAL CIRCUIT ANALYSIS AND DESIGN (3 Units)

Review of device models, Digital building blocks, Storage elements and sequential circuits Circuit techniques for array architectures, Interconnects, Energy consumption, Timing issues Memory architecture ***Pre-requisite EEE 202***

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

i. Understand and apply various device models in the context of digital circuits, demonstrating proficiency in evaluating their performance and limitations.
ii. Design and implement fundamental digital building blocks, including combinational and sequential circuits, using appropriate storage elements and assess circuit techniques for array architectures, identifying the trade-offs between different approaches regarding performance and efficiency.
iii. Analyze the role of interconnects in circuit design, understanding their impact on overall system performance and reliability, and to evaluate energy consumption in digital circuits, employing strategies to minimize power usage while maintaining performance.
iv. Identify and troubleshoot timing issues in sequential circuits, ensuring reliable operation in digital systems, and analyze various memory architectures, understanding their implications for speed, capacity, and efficiency in digital systems
v. Synthesize knowledge from device models, circuit techniques, and memory architectures to propose innovative solutions to complex digital design challenges.

EEE 310: MEASUREMENT & INSTRUMENTATION (3Units)

Introduction to Signals and Measuring Systems, Modeling of Measuring Systems, Instrument for direct measurement of current and voltage, Measurement of resistance, inductance and capacitance, measurement of electrical energy, power, power factor and frequency. Principle of cathode-ray oscilloscope, Transducers, Analog Signal Processing, Analog to Digital and Digital to Analogue Conversion, Design of measurement systems, transducers, instrumentation amplifier, differential amplifier circuits, sample-and-hold circuits, multipliers, linear and non-linear converters, Signal recovery. ADCs and DACs, Digital signals processing, Introduction to Biomedical-Electronics and medical instrumentation.

Pre-requisites EEE 201 & EEE 202

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

- ***i.*** Understand and apply principles of signal measurement systems
- ***ii.*** Analyze and design measurement systems using transducers and analog circuits
- ***iii.*** Evaluate analog and digital signal conversion techniques
- ***iv.*** Apply digital signal processing in measurement systems
- ***v.*** Explore biomedical electronics and medical instrumentation systems

EEE 313: ELECTRONIC CIRCUITS I (3 Units)

Semiconductor devices – models, characteristics and applications, small signal amplifiers. Audio amplifiers, class A, AB, B, C, and push-pull design, Basic digital electronics: Boolean algebra, switching circuit design. Analysis, design of combinational circuits.

Pre-requisites EEE 201, 202

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

- ***i.*** **Understand Semiconductor devices** fundamental principles which includes their models and characteristics, and to evaluate their applications in various electronic circuits.
- ***ii.*** **Design Small Signal Amplifier** and analyze small signal amplifiers, differentiating between various classes (A, AB, B, C) and understanding their operational characteristics and performance metrics.
- ***iii.*** Evaluate audio amplifier circuits, employing push-pull design techniques, and assess their efficiency and sound quality in practical applications.
- ***iv.*** Analyze and design combinational logic circuits, effectively applying theoretical concepts to solve practical engineering problems in digital electronics using Boolean algebra to simplify and design switching circuits, demonstrating proficiency in logic functions and digital circuit analysis.
- ***v.*** Synthesize the knowledge of semiconductor devices and digital electronics to develop integrated solutions, showcasing an understanding of how different components work together in electronic systems.

EEE 314: ELECTRICAL MACHINES II (3 Units)

Electromechanical energy conversion, emf equations, synchronous machines, 3-phase alternator. Instability, mathematical representation of characteristics, polar diagram.

Synchronous motor: construction, characteristics, circuit diagram. Induction motor: construction, characteristics, torque/slip relation, speed control, induction generator, single phase induction motor applications. ***Pre-requisites EEE 315***

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

i. Describe and explain the construction, characteristics, and operating principles of synchronous machines (alternators and motors).

ii. Calculate and model torque-speed relationships in induction motors and demonstrate speed control methods.

iii. Analyze the mathematical representation and characteristics of synchronous machines using polar diagrams.

iv. Evaluate the performance of induction machines under varying load conditions and recommend appropriate control strategies.

EEE 315: ELECTRICAL MACHINES I (3 Units)

Energy conversion concepts, DC machines: generators, motors, shunt and series characteristics, design, construction. Transformer: equivalent circuits, design, construction, characteristics. Open/Short circuit, polarity tests. Regulation, Auto, three-phase transformer, Connections. ***Pre-requisites EEE 201***

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

i. Describe and explain the construction, characteristics, and operating principles of synchronous machines (alternators and motors).

ii. Calculate and model torque-speed relationships in induction motors and demonstrate speed control methods.

iii. Analyze the mathematical representation and characteristics of synchronous machines using polar diagrams.

iv. Evaluate the performance of induction machines under varying load conditions and recommend appropriate control strategies.

EEE 316: APPLIED COMPUTER PROGRAMMING (2 Units)

Software development life cycle. Top-down design. Programme design using pseudo-code, flowchart. Flowchart ANSI symbols and usage. Programming using structured language such as C: symbols, keywords, identifiers, data types, operators, various statements, operator precedence, type conversion, conditional and control structures, array, function, recursive functions parameter passing, pointers, structure, union. File Handling. Software Development in C in MS Windows, UNIX/LINUX environments. ***Pre-requisite CSC 201***

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

i. Understand basic Python syntax, data types (strings, lists, dictionaries, tuples), control structures (if/else, for loops, while loops), functions, and modules.

ii. Write Python programs to solve real-world problems using variables, data types, control structures, functions, and modules.

iii. Read and write files, persist data, and perform basic data analysis using Python libraries (e.g., math, statistics).

iv. Use print statements, debuggers, and error handling to identify and resolve errors in Python code

EEE 317: USE OF ENGINEERING SOFTWARE PACKAGES (2 Units)

Introduction to MATLAB and their engineering applications. Introduction to AUTOCAD and their engineering applications. Introduction to simulation-to-simulation package

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

i. Demonstrate proficiency in using the engineering packages MATLAB and Excel.
ii. Application of MATLAB and Excel to solve problems including modeling, simulation and analysis of systems.
iii. Utilizing MATLAB and Excel for data analysis, visualization and interpreting results to inform decisions.
iv. Generate comprehensive and relevant reports and results.

v. Design and implement small Python projects that integrate various programming concepts, such as data structures, loops, functions, and file handling.

EEE 318: ELECTRIC CIRCUIT THEORY II (3 Units)

Foster-Cauer synthesis. Single-port network analysis. Active filters. Chebysbev filters. Approximation to non-linear characteristics of non-linear resistive circuits. Harmonics analysis techniques. Introduction to CAD ***Pre-requisites EEE 309***

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

i. Recall and identify the principles of Foster-Cauer synthesis and single-port network analysis.
ii. Explain and differentiate between active and Chebyshev filters.
iii. Apply harmonic analysis techniques to electrical circuits and demonstrate their impact on system performance.
iv. Evaluate the design and performance of filters and harmonic suppression systems.
v. Design circuits using CAD tools for advanced synthesis and filtering applications.

EEE 319: MINI PROJECT I (2 Units)

Students will be divided into groups and assigned mini electronic circuit design projects to carry out.

EEE 320: ELECTRONIC CIRCUITS II (3 Units)

Operational amplifiers, Feedback amplifiers. Oscillators, power amplifiers, tuned amplifier. Wave shaping sequential circuits, definition, and characteristics and design. Flip flops, memory circuits, logic families – TTL, ECL, RTL, DTL, LSI, VLSI digital systems design.
Pre-requisites EEE 313

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

i. Analyze the operation of various types of amplifiers including operational amplifiers, feedback amplifiers, power amplifiers, and tuned amplifiers.

ii. Explain the principles of oscillation and design oscillator circuits for specific applications.
iii. Design and analyze wave-shaping circuits using sequential circuits and explore their characteristics and applications in signal processing.
iv. Describe the operation of flip-flops and memory circuits, and design systems based on sequential logic.
v. Differentiate between various logic families such as TTL, ECL, RTL, and DTL, and understand their characteristics and applications in digital systems, with an ability to utilize concepts of LSI (Large Scale Integration) and VLSI (Very Large Scale Integration) in digital systems design, incorporating the use of modern design tools.

EEE 321: ELECTRIC CIRCUIT THEORY I (3 Unit)

Circuit elements, sources, circuit theorems, applications. Network response to steps, ramp, impulse, Network functions, response to steps, ramp, impulse, Network functions, response to exponential, sinusoidal sources. Laplace transform, pole-zero analysis, network synthesis, resonance, two-port analysis, ladder network, Star-Delta transformation.

Pre-requisites EEE 201

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

i. Describe and explain the network response to different types of inputs, including step, ramp, impulse, and sinusoidal sources.
ii. Apply Laplace transforms and perform pole-zero analysis for electrical networks.
iii. Analyze network functions and synthesize electrical circuits for specific responses using resonance and network synthesis techniques.
iv. Evaluate two-port networks and ladder networks for complex electrical system applications.

EEE 323: ELECTROMAGNETIC FIELDS AND WAVES I (3 Units)

Electrostatics, electric field, potential, Coulomb's law, Gauss law, Laplace and Poisson equations, electric displacement, dipoles, boundary conditions, uniqueness theorem, image method. Magnetostatics induction, flux, field strength, vector potential, Ampere's law, Magnetic force, moving change, electromagnetic induction, Maxwell's equations, free space wave propagation ***Pre-requisites EEE 202***

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

i. Analyze and solve problems of electromagnetic scalar and vector fields in rectangular, cylindrical, and spherical coordinates.
ii. Explain and apply the various electromagnetic laws such as the Coulomb's law and Gauss' law
iii. Derive and explain the physical implications of Maxwell's equations in rectangular coordinates
iv. Explain wave propagation mechanism in conductors and unbounded dielectric media.
v. Apply the principle of waves, field and magnetic induction to bring up innovative experimental design focusing on solving human challenges

EEE 331: ENGINEERING MATHEMATICS III (3 Units)

Numerical analysis and its application to engineering problems. Operational methods, transform, series and special functions in engineering. ***Pre-requisites EEE 231,232***

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

i. Apply numerical methods for solving equations and performing interpolation
ii. Utilize Laplace transforms and inverse Laplace transforms for system analysis
iii. Employ Fourier transforms for signal processing and analysis.
iv. Solve ordinary differential equations (ODEs) using numerical methods
v. Optimize engineering problems using linear programming and other optimization techniques.
vi. Understand and apply series and special functions in various engineering contexts

EEE 332: ENGINEERING MATHEMATICS IV (3 Units)
Mathematical modelling 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.
Pre-requisites EEE 331

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

i. Identify various mathematical models for physical systems across various engineering applications.
ii. Apply direct integration and numerical techniques to solve partial differential equations analysis
iii. Analyze and solve boundary value problems using appropriate methods.
iv. Utilize Fourier integrals and series for function representation and signal analysis.
v. Understand and apply orthogonal functions and Sturm-Liouville systems in problem-solving

EEE 381: ELECTRICAL & ELECTRONICS LABORATORY COURSE I (2 Units)
Laboratory experiments to demonstrate the application of the theory covered in the courses.

EEE 382: ELECTRICAL & ELECTRONICS LABORATORY COURSE II (2 Units)
Laboratory experiments to demonstrate the application of the theory covered in the courses.
Pre-requisites EEE 381

EEE 400 STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME (6 Units)
A comprehensive internship programme in which students spend a full semester in approved engineering establishments (private and public) and industries. The exposure also provide opportunity for students to sharpen their technical writing skill through field reports, keeping log – books and prepared technical documents under close supervision of industry-based professionals and lecturers.

EEE 401: ELECTRIC POWER PRINCIPLES (3 Units)
Introduction to power systems, Properties of three-phase systems, Energy sources, Components of power generating systems, Transmission line and underground cables, Design and organization of power stations, Power system equipment: standards and safety.
Pre-requisites EEE 315

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

i. Identify and describe the major components of an electric power system
ii. Identify and describe renewable and non-renewable sources of electrical power generation
iii. Apply the principle of hydro storage scheme to power generation
iv. Explain the concept of load flow and its methods
v. Analyze load curves and describe the importance of load forecasting
vi. Design a power system model using per unit representation

EEE 407: INTRODUCTION TO CONTROL ENGINEERING (3 Units)

Feedback concept, advantages, systems classification, structures, control systems components-mechanical, electrical, hydraulic, thermal, position control, transient analysis of servomechanism, signal regulators compensation techniques, series/parallel feedback controllers. System transfer functions, signal flow graphs, stability, Routh-Hurwitz criteria.

Pre-requisites EEE 316

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

i. Understand the basic concepts, classifications and principles of controls system including open-loop and closed- loop systems.
ii. Develop mathematical models for representation of dynamic system using differential equations.
iii. Use of signal flow graphs in identifying and develop the system transfer functions.
iv. Application of Mason's gain rule to determine system transfer functions.
v. Analyze the stability of control systems using the Routh-Hurwitz criteria.

EEE 413: DIGITAL ELECTRONICS (3 Units)

Boolean algebra and truth table. Switching circuits. Electronic logic gates, basic functional components. Analysis of combinational circuits. Synthesis of combinational logic circuit. Karnaugh maps. K-maps of four or more variables. Simplification of switching functions. Computer-aided minimization of switching functions. Algebraic method of determining prime implicants. Digital vs. analog systems. Mixed signal design, analogue and digital grounding. Digital system design hierarchy. Logic devices: TTL, CMOS families, technology, applications. Memory devices. Latches, Flip-flops. Modular design. Decoders. Implementing logic functions using decoder. Encoder circuit structures. Multiplexer circuits. Computer- aided design of modular systems. ***Pre-requisites EEE 320 & EEE 308***

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

i. Demonstrate proficiency in Boolean algebra and truth tables, applying fundamental concepts to solve logical expressions, and design switching circuits using electronic logic gates, identifying key components and their functions, to conduct comprehensive analyses of combinational circuits, utilizing techniques such as truth tables and Boolean expressions.
ii. Synthesize combinational logic circuits, effectively applying design principles and methodologies, by employing Karnaugh maps (K-maps) for simplifying Boolean expressions, including those with four or more variables, by simplifying switching

functions using various methods, including computer-aided techniques and algebraic approaches.

iii. Compare and contrast digital and analog systems, understanding their respective applications and characteristics, to know the hierarchy of digital system design, by illustrating how various components interact within a system.

iv. Identify various logic device families, such as TTL and CMOS, discussing their technologies and applications in circuit design, analyzing memory devices, including latches and flip-flops, and their roles in digital systems, and apply modular design principles in developing digital systems, focusing on efficiency and scalability.

v. Design and implement decoder and encoder circuits, understanding their structures and applications in digital logic. Create and analyze multiplexer circuits, applying them to implement various logic functions, by employing computer-aided design (CAD) tools for the design and analysis of modular systems, enhancing efficiency and accuracy in digital system development.

EEE 415: SIGNALS AND SYSTEMS (3 Units)

Classification of Signals and Systems, Systems properties, Fourier series, Fourier transform Sampling of ICT signals, Sinusoidal modulation, Laplace transforms applications, Feedback systems, z – transform ***Pre-requisites EEE 201 & EEE 202***

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

i. Understand the fundamental concepts and classifications of signals and systems, including their properties and behaviors.

ii. Demonstrate proficiency in applying Fourier series and Fourier transforms for frequency analysis of signals.

iii. Apply theoretical knowledge of signal sampling and sinusoidal modulation to practical signal processing tasks.

iv. Evaluate and implement the use of Laplace transforms, feedback systems, and the z-transform in analyzing signals and systems.

v. Apply principles of signal processing and system analysis in practical engineering contexts to solve complex signal-related challenges.

EEE 417: PRINCIPLES OF COMMUNICATION ENGINEERING (3 Units)

Brief historical development of communications. Block diagram of a communication system. The frequency spectrum. Modulation: Reasons for, types of (analogue/digital). AM systems: DSB, BSBSC, SSB, ISB, VSB and their generation, detection, spectrum, power, applications. FM systems: frequency deviation, modulation index, significant sideband criteria, bandwidth of a sinusoidally modulated FM signal, power of an FM signal, narrow banf FM, direct and indirect FM generation, various methods of FM demodulation: discriminators, phase-locked loop, limiter, pre-emphasis and de-emphasis. Noise waveform and characteristics. Effects of noise on AM and FM systems. Pulse modulation systems: PAM, PWM, PPM and their generation, detection and applications. Multiplexing techniques: FDM and TDM. Pulse code modulation (PCM). Antenna principle and design. Block diagram of a superheterodyne radio

receiver, broadcast band and specification. TV broadcast band and specification. Signal format, transmitter and receiver block diagrams of Black and White TV and Color TV. Introduction to digital broadcasting. ***Pre-requisites EEE 321***

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

i. Remember and understand the historical development of communication systems, block diagrams of communication systems, and the frequency spectrum.
ii. Apply knowledge of modulation techniques, explaining the reasons for modulation and differentiating between types (AM, FM, Pulse Modulation).
iii. Analyze AM and FM systems in terms of their generation, detection, spectrum, and power, and calculate bandwidth requirements.
iv. Evaluate the effects of noise on AM and FM systems and different demodulation methods, including discriminators and phase-locked loops.
v. Apply and analyze multiplexing techniques (FDM, TDM) and Pulse Code Modulation (PCM) in communication systems.
vi. Understand and apply principles of antenna design, superheterodyne radio receivers, TV broadcasting systems, and digital broadcasting.

EEE 421: ELECTROMAGNETIC FIELDS AND WAVES II (3 Units)
Propagation of electromagnetic waves in free space and in material media. Dielectric, conductors and ionized media. Transmission line theory including wave guides and resonators, smith chart. Radiating elements and antenna theory.
Pre-requisites EEE 323
At the end of the course students are expected to be able to:

i. Explain the basic concept of Propagation of electromagnetic waves in free space and in material media.
ii. Evaluate and describe the Dielectric, conductors and ionized media.
iii. Analyze the various types of Transmission line theory including.
iv. Compare and contrast between the wave guides, resonators and smith chart.
v. Understand the architecture of Radiating elements.
vi. Discuss of effect of antenna theory.

EEE 423: MINI PROJECT II (1 Unit)
Students will be divided into groups and assigned mini-design projects to carry out.
Pre-requisites EEE 319

EEE 425: ELECTRICAL & ELECTRONIC LABORATORY COURSE III (1 Unit)
Laboratory experiments for electronics, control, communication and power courses
Pre-requisites EEE 382
At the end of the course students are expected to be able to:

i. Apply Theoretical Knowledge to Practical Systems
ii. Analyze and Interpret Experimental Data,

iii. Analyze and Interpret Experimental Data,
iv. Construct and Optimize Systems
v. Evaluate Technical Information

EEE 501: FINAL YEAR PROJECT I (3 Units)

Original individual student project related to a prescribed electrical engineering problem involving literature review, identification, definition and formulation of the problem, theoretical investigations, modeling simulation, analysis and design.

EEE 502: FINAL YEAR PROJECT II (3 Units)

Second phase of investigations involving the implementation of the designed model, debugging, calibration, testing, data collection and analysis, and presentation of a comprehensive written report of the investigations. ***Pre-requisites EEE 501***

EEE 504: DIGITAL SIGNAL PROCESSING (3 Units)

Discrete-time systems and sampling, z-transforms, Discrete Fourier Transforms and Fast Fourier Transforms, Digital Processors, Digital Filters, Introduction to spectral analysis, Introduction to adaptive filtering, Introduction to signal compression

Pre-requisites EEE 309

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

i. Understand and apply discrete-time systems, sampling theory, and z-transforms
ii. Implement and analyze Discrete Fourier Transforms (DFTs) and Fast Fourier Transforms (FFTs)
iii. Design and evaluate digital filters (FIR and IIR)
iv. Apply spectral analysis techniques to signal processing
v. Explore adaptive filtering and signal compression techniques

EEE 507: ADVANCED CIRCUIT TECHNIQUES (3 Units)

Analysis and Design of integrated operational amplifiers and advanced circuits such as wideband amplifiers, instrumentation amplifiers, multiplier circuits, voltage-controlled oscillators, and phase locked loops. Design techniques for advanced analogue circuits containing transistors and operational amplifiers. Simulation of circuits using appropriate packages e.g. PSPICE, Electronic Workbench, Visio Technical, e.t.c. should be encouraged.

Pre-requisites EEE 320 & EEE 308

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

i. Discuss the fundamental concepts of integrated operational amplifiers and advanced circuits
ii. Explain the basic element and type of integrated operational amplifiers and advanced circuits
iii. Apply the different designs of wideband amplifiers, instrumentation amplifiers, multiplier circuits, voltage-controlled oscillators, and phase locked loops
iv. Describe the Design techniques for advanced analogue circuits containing transistors and operational amplifiers.

v. Illustrate the concepts of Simulation of circuits using appropriate packages e.g. PSPICE, Electronic Workbench, Visio Technical, e.t.c. should be encouraged.

EEE 509: CONTROL SYSTEMS ENGINEERING (3 Units)

Linear control systems, Stability: Nyquist stability criterion, bode diagram approach, root locus and root contour method, Design of linear servo systems, State -space systems, Compensator design using the bode and root locus methods, Multiple loop feedback systems, Minimization of unwanted disturbance, Single and multi-term electronic controllers, Hydraulic and pneumatic controllers, Sensitivity of control systems, control systems and automation. ***Pre-requisites EEE 407***

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

i. Analyze the stability of linear control systems using various methods
ii. Design compensators and controllers for desired system performance
iii. Apply state-space techniques for system modeling and analysis.
iv. Understand and implement control strategies for hydraulic and pneumatic systems
v. Evaluate system sensitivity and robustness against disturbances and parameter variations

EEE 510: RELIABILITY ENGINEERING (2 units)

Introduction to reliability, maintainability and metrics. Application to computer hardware systems, communication equipment, power systems, electronic components. Basic maintenance types. Fault troubleshooting techniques. QoS and time of availability of data communication. Quality control techniques. Design for higher reliability, fault tolerance. Software Reliability: specification, and metrics. Programming for reliability, software safety and hazard analysis. Comparison of hardware and software reliability. Software Quality and Assurance. Software quality metrics. Ensuring Quality and Reliability: verification and validation, measurement tracking and feedback mechanism, total quality management, risk management.

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

i. Explain the basic concept of reliability, maintainability and metrics and Application to computer hardware systems, communication equipment, power systems, and electronic components
ii. Evaluate and describe the Basic maintenance types and Fault troubleshooting techniques
iii. Analyze the QoS and time of availability of data communication. Quality control techniques as well as Designing for higher reliability, fault tolerance.
iv. Compare and contrast between the Software Reliability: specification, and metrics. Programming for reliability, software safety and hazard analysis. Comparison of hardware and software reliability.
v. Understand the Software Quality and Assurance and Software quality metrics.
vi. Discuss of effect of Ensuring Quality and Reliability: verification and validation, measurement tracking and feedback mechanism, total quality management, risk management.

EEE 521: INTRODUCTION TO MODERN CONTROL (3 Units)

Digital control; concept of sampling, Z-transform, inverse zero-order-hold, stability analysis. State variables of dynamic system, formulation of state vector differential equation, solution state equation, transition matrix, eigenvalues and vectors. System response and stability. Finite word length effect. Digital 3-term PID design. Introduction to Neural Networks. Introduction to fuzzy control system. Introduction to mechatronics and robotics.

Pre-requisites EEE 407

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

i. Define the concept of sampling and use of Z- transform in control systems.
ii. Describe the basic concepts of Neural networks and Fuzzy systems to control systems.
iii. Understand the concept of modern control theory including state-space representation.
iv. Develop mathematical models of dynamic control systems using the state-space method.
v. Analyze the stability and performance of control systems using eigen values and Routh-Hurwith criteria.

EEE 525: POWER ELECTRONICS (3 Units)

Rectification and smoothing techniques. Voltage and current regulation, regulator circuits, the thyristor or SCR and its applications, timing circuits, motor speed control, power translator and integrated circuits, welding and heating. Power electronic and automation.

Pre-requisites EEE 301 & EEE 401

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

i. Discuss the fundamental concepts of Rectification and smoothing techniques
ii. Explain the basic element and type of Voltage and current regulation
iii. Apply the different designs of regulator circuits, the thyristor or SCR and its applications
iv. Describe the timing circuits, motor speed control, power translator
v. Illustrate the concepts of integrated circuits, welding and heating

EEE 527: BROADCASTING AND INTERNET TECHNOLOGY (3 Units)

Elements of broadcasting system. Studio: Design, acoustic, and equipment. Broadcasting regulations. Frequency spectrum: allocation, and licensing. Regulatory bodies. Design, configuration, and services of CATV, MATV, MMDS systems. Multipath problems. Polarization, field strength, and footprint. Transmitter power rating, beamwidth, interference and minimum separation. Frequency spectrum management of digital and analogue broadcasting. Antenna design and installation for radio, television, and satellite. Antenna support: Mast, Tower, High altitude design and application. Digital Audio Broadcasting. Analogue television standards: Digital Television standards: MPEG, DVB, channel coding techniques. HDTV. Digital television/Monitor set: LCD, and plasma technology. Internet Technology: The internet, definition and services. Internet architecture, OSI layers, TCP/IP, Internet addressing, IPv4, IPv6. Internet broadcasting: principles, components, standards, and applications. ***Pre-requisites EEE 417***

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

i. Discuss the fundamental concepts of Broadcasting and Internet Technology and its elements.

ii. Explain the basic element of broadcasting and types of designs configurations and services.

iii. Apply the different designs to establish the multipath problems, polarization, field strength and footprints.

iv. Describe the transmitter power, frequency spectrum management, antenna designs and installation.

v. Illustrate the concepts of digital audio broadcasting, internet architecture, and internet broadcasting.

EEE 528: DATA COMMUNICATIONS AND NETWORKS (3 Units)

Introduction to Data communications. LAN topology, access methods, signaling methods. WAN systems. Protocols: Introduction to network protocol. Seven layer ISO-OSI standard protocols and network architecture. Peer-to peer, Client Server. Client-Server requirements. Information Network Software. Features and benefits of majority recovery mechanisms. Network Operating Systems. Internet protocol, IPv4, IPv6. Internet programming, Intranet. System administration and security issues.

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

i. Understand the fundamental concepts of data communications, including LAN topologies, access methods, and signaling methods.

ii. Apply knowledge of network protocols, specifically the ISO-OSI seven-layer model, to analyze network architectures and operations.

iii. Analyze peer-to-peer and client-server models, including client-server requirements and the role of information network software.

iv. Evaluate the features and benefits of network operating systems and majority recovery mechanisms in data communications.

v. Apply and analyze Internet protocols (IPv4 and IPv6) and their implications for internet programming and intranet systems.

vi. Understand and assess system administration and security issues related to data communications and networks.

EEE 529: MOBILE & PERSONAL COMMUNICATION SYSTEMS (3 Units)

Evolution and example of mobile radio communications. Basic cellular system, frequency reuse, Roaming, Hand-off strategies, Co-channel interference, Traffic and Grade of service. System capacity and improvement. Propagation path loss, multipath propagation problem, Raleigh fading, Rican distribution. Doppler effect. Field strength prediction models. Standards and overview of analogue and digital cellular systems: AMPS,TACS, GSM, CT2, PCN, DECT, PHS. Frequency management and channel assignment. GSM: Architecture, elements, and standard interfaces. Third generation wireless standards. Paging & SMS services and technologies. Call processing. Signaling. Roaming and mobility management; route optimization. Internet of Things. Cognitive Radio ***Pre-requisites EEE 417***

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

i. Explain the evolution of mobile radio communications and the components of basic cellular systems, including frequency reuse, roaming, hand-off strategies, and co-channel interference.
ii. Evaluate traffic management strategies, grade of service, system capacity, and potential system improvement techniques to optimize cellular network performance.
iii. Analyze radio propagation path loss, multipath propagation problems, and the effects of Raleigh fading, Rician distribution, and Doppler shift on mobile communication signals.
iv. Compare and contrast analogue and digital cellular systems such as AMPS, TACS, GSM, CT2, PCN, DECT, and PHS, focusing on their architecture, frequency management, and channel assignment methods.
v. Understand the architecture, elements, and standard interfaces of GSM systems, and explain the processes behind call processing, signaling, paging, SMS services, and roaming.
vi. Discuss third-generation (3G) wireless standards, cognitive radio technologies, and the integration of mobile communication systems with the Internet of Things (IoT).

EEE 530: ASSEMBLY LANGUAGE PROGRAMMING (3 Units)

Language level of abstraction and effect on machine, characteristics of machine code, advantages, justification of machine code programming, instruction set and dependency on underlying processor. Intel 8086 microprocessor assembly language programming: programming model as resources available to programmer, addressing modes, instruction set-arithmetic, logic, string, branching, program code, machine code, input/output, etc; assembly 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-assembly for Motorola.

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

i. Define and explain the key concepts of assembly language, including instruction sets, registers, memory addressing, and the role of the assembler.
ii. Demonstrate knowledge of basic microprocessor architecture, including the role of the ALU, control unit, registers, and memory hierarchy.
iii. Write syntactically correct assembly programs that demonstrate proficiency in the language's basic structure, instructions, and directives.
iv. Understand and apply concepts of data representation, including binary, hexadecimal, and ASCII data formats.
v. Implement different memory addressing modes such as direct, indirect, indexed, and register-based addressing.

Pre-requisites EEE 316

EEE 533: MICROCOMPUTER HARDWARE AND SOFTWARE TECHNIQUES (3 Units)

Comparison of hardwired vs programmable digital systems. Von Neumann architecture. Block diagram of digital computer and description of its components. Single address machine. Micro-processor sytem: CPU, memory, I/O, and buses subsystems using INTEL &

MOTOROLA families and their programming models. Interrupt system. Memory system: static, dynamic, VRAM and applications. Memory inter-facing and address decoding. 8031 microcontroller and programming. PIC micro-controller and programming. Interfacing to microcomputer, microprocessor, microcontroller, and PIC. Software: monitor and device driver for embedded system.

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

i. Explain the basic concept of microcomputer hardware and software
ii. Evaluate and describe the components of microcomputer hardware's and software.
iii. Analyze the micro-processors system, the buses subsystem, and their programing models.
iv. Compare and contrast the memory system, memory interfacing and address decoding
v. Understand the architecture of interfacing between microcontroller and programming
vi. Discuss monitor and device driver for embedded system.

EEE 534: DESIGN OF ELECTRICAL AND ICT SERVICES (2 Units)

Basic electrical installations. Distribution system. Regulation-IEEE, NSE, Nigeria standard. Illumination. Cables-types, rating, wiring systems, earth protection. Auxiliary electrical system-fire alarm, telephone, elevator circuit. Design of electrical installation – Domestic, industrial, commercial air-conditioning. Telecommunication Design & Installation: Telephone, PABX, cables, trucking, calculations, etc. Computer Networking: Design, Calculations, topology, cables, cabling, etc. satellite and VSAT installation. Surge and lighting protections. Earthing: earth resistivity measurement, surge and lighting equipment selection and installation. Contract proposal and document preparation. Costing and preparation of BEME. Basic law of contract. Commissioning. Environmental Impact Assessment (EIA)

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

i. Comprehend power supply and distribution systems
ii. Explain regulations governing electrical installations
- IEE, NEC, Nigerian standards
- Selection of cables and conductors, wire systems and accessories, outdoor low voltage lines and cables

iii. Design of electrical installation for domestic, industrial and commercial
- Lighting installations and basic power installation
- Use of software for electrical designs

iv. Carry out protection of low voltage installation
- Earthing and testing of electrical installations

v. Prepare contract proposals and documentations

EEE 535: POWER SYSTEM ENGINEERING I (3 Units)

Overhead Transmission Lines: Transmission line parameters (R,L and C) calculations. Equivalent circuits of transmission line, Underground types and parameters. Modeling of

Power Components. Transformers, transmission lines and synchronous machines; System Modeling. Per unit calculations, network matrices. Power Flow Analysis Gauss Siedel, Network-Raphson, and Fast decoupled methods. Control of voltage, real and reactive power in load flow problems. Faults in Power Systems: Short-circuit analysis of synchronous machines. Synchronous and unsymmetrical fault analysis. Use of advanced power tools for power system modelling (HOMER, ETAP, Digsilent etc) ***Pre-requisites EEE 401***

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

i. Understand power system line models and their performance characteristics
ii. Apply per unit system calculations for power system analysis
iii. Analyze power flow in electrical networks and perform optimal generation dispatch
iv. Conduct balanced and unbalanced fault analysis using symmetrical components
v. Apply theoretical concepts to real-world power system scenarios

EEE 536: POWER SYSTEMS ENGINEERING II (3 Units)

System Stability: Transient stability swing equation, equal area criterion, multimachine stability, power system stabilizers. Automatic Generation Control and Voltage Regulation: Circuits breakers, relays, instrument transformers, protective schemes control circuits. Protection of transmission lines, transformers, generators and motors. Automatic reclosure and cut-in of standby supply. Power System Planning: Design considerations and load forecasting. Area Co-ordination and Pooling. Siting of new generation stations. Station management and maintenance routine, renewable energy generation (solar and wind).

Pre-requisites EEE 535

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

i. Understand the fundamentals of power system stability and its implications for system performance
ii. Explore control mechanisms used in power systems to maintain reliability and efficiency
iii. Analyze load characteristics and explain forecasting techniques for demand management
iv. Examine electrical energy tariff structures
v. Perform power flow tracing for effective monitoring and management of power systems.
vi. Understand power system protection schemes to ensure safety and reliability

EEE 537: ELECTRICAL ENERGY CONVERSION AND STORAGE (3 Units)

Electromechanical energy conversion, sources of motive power. Waste heat recovery. Solar energy nuclear power other sources of energy. Wind, geothermal, primary and secondary cells, cars and heavy vehicle batteries, testing, fault diagnosis, repairs effect of environmental factors on battery life, small-scale power sources ***Pre-requisites EEE 401***

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

i. Explain the basic concept of electrical energy conversion and storage
ii. Evaluate and describe the electromechanical energy conversion and sources for motive power.
iii. Analyze the various types of energy with their conversion and storage.
iv. Compare and contrast between the types of energy with their applications
v. Understand the architecture of power storage and batteries.
vi. Discuss of effect of environmental factor on battery life.

EEE 538: SATELLITE COMMUNICATIONS (3 Units)

Satellite Communication: Types (LEO, GEO etc), orbits, frequency bands, applications, and services. Antenna: types, gain, pointing losses, G/T, EIRP; high power amplifiers; low noise amplifiers; BUC/LNB: conversion process, polarization hopping, redundancy configurations; earth station monitoring and control. Basic link analysis, attenuation, sources of interference, carrier to noise and interference ration, system availability, frequency reuse, link budget, link design. Multiple access techniques. VSAT networks: Technologies, network configurations, multi-access and networking, network error control, polling VSAT networks. Mobile radio systems: paging, cordless telephones, cellular radio. Trends in cellular radio and personal communications. Standards and overview of analogue and digital cellular systems: AMPS, TACS, GSM, CT2, PCN, DECT, PHS. Frequency management and channel assignment. GSM: Architecture, elements and standard interfaces; FDMA/TDMA structure. Third and fourth generation wireless standard. Global Positioning System: principles, and applications.

Pre-requisites EEE 417

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

i. Explain the Satellite Communication, services and application.
ii. Evaluate and describe Antenna, G/T, EIRP; BUC/LNB, multiple access techniques, and polarization
iii. Analyze VSAT networks, mobile radio system and trend in cellular radio and personal communication.
iv. Compare and contrast between AMPS, TACS, GSM, CT2, PCN, DECT, and PHS.
v. Understand the architecture of GSM, FDMA, TDMA structure and third and fourth generation.
vi. Discuss on global positioning system

EEE 540: DIGITAL COMPUTER NETWORKS (3 Units)

Communication within computer systems: addressing and databases. CPU – memory – I/O device communications. Communication between systems: host/host versus host/slave relationships, handshaking protocols and sychronisation. Serial versus parallel communications. Hardware elements of network design – terminals, modems, multiplexors, and concentrators. Message and control processors. Communication equipment and carriers. Software elements of computer networks: host operating systems. Message and packet switching. Structure of computer networks: star, ring, and hierarchical networks. Decentralized networks. Introduction to artificial intelligence

Pre-requisites EEE 415

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

i. Explain the Communication within computer systems and between computer systems.
ii. Evaluate and describe Serial versus parallel communications.
iii. Analyze Hardware elements of network design, message and control processors, communication equipment and carriers
iv. Compare Software elements of computer networks
v. Understand the architecture of Message and packet switching. Structure of computer networks.
vi. Discuss on Decentralized networks.

EEE 542: SYSTEM DESIGN & VHDL PROGRAMMING (3 Units)

Finite State Machine. Sequential circuits design. Structured design: Design constructs, Design levels, Geometry-based interchange formats, Computer aided electronic system design tools, Schematic circuit capture, Hardware description languages, design process. Introduction to VHDL: language, design. Concurrent VHDL, sequential VHDL, Advanced features of VHDL. Structured level modeling, register-Transfer level modeling, FSM with datapath level modeling, Algorithm level modeling. Introduction to ASIC , FPGA Design. Paradigm, FPGA synthesis, FPGA/CPLD Architectures. VHDL synthesis, optimization and mapping, constraints, technology library, delay calculation, synthesis tool, synthesis directives. Computer-aided design of logic circuits. ***Pre-requisites EEE 316***

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

i. Description of digital systems using VHDL code.
ii. Demonstrating proficiency in VHDL code in system representation.
iii. Identify Finite State Machines and types.
iv. Design and implement digital circuits using VHDL including combinational and sequential logic.
v. Conduct simulations of VHDL designs to verify functionality and performance.

EEE 544: SWITCHGEAR AND VOLTAGE ENGINEERING (3 Units)

Generation and measurement of high voltage and current. Breakdown theories of gaseous liquid and solid dielectrics. Lightning phenomenon. High voltage equipment, insulation coordination, lightning protection, electric cables and condensers, automated switch gear,

Pre-requisites EEE 401

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

i. Explain the Generation and measurement of high voltage and current
ii. Evaluate and introduce Breakdown theories of gaseous liquid and solid dielectrics.
iii. Analyze Lightning phenomenon
iv. Compare High voltage equipment
v. Understand insulation coordination, lightning protection,
vi. Discuss electric cables and condensers

EEE 546: DIGITAL COMMUNICATION PRINCIPLES (3 Units)

Extraction of digital signal from noise. Pulse shaping. Optimum reception. Broadband analysis. Intersymbol interference (ISI). Matched filtering. Equalizers. ASK, FSK, GPSK, DPSK with noise, phase referencing and timing. Correction code. Decoding.

Pre-requisites EEE 417

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

i. Understand the fundamental concepts of extracting digital signals from noise and the principles of pulse shaping.
ii. Demonstrate proficiency in analysing and implementing optimum reception techniques and broadband analysis.
iii. Apply knowledge of intersymbol interference (ISI) and matched filtering to improve signal transmission quality.
iv. Evaluate the performance of equalizers and different digital modulation schemes (ASK, FSK, GPSK, DPSK) in the presence of noise
v. Analyse error correction codes and decoding techniques to enhance the reliability of digital communication systems.