DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING

FACULTY OF ENGINEERING
AHMADU BELLO UNIVERSITY, ZARIA

(B.ENG) ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING CURRICULUM REVIEW

2021

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING
AHMADU BELLO UNIVERSITY, ZARIA

1. INTRODUCTION

Ahmadu Bello University, Zaria at its creation in 1962 inherited the Engineering program from the Nigeria College of Arts, Science, and Technology, Zaria. The program was re-organized to award degrees in Electrical, Mechanical and Civil Engineering under the auspices of the University of London from 1962 to 1965. Thus, the Faculty of Engineering was born along sides the Departments of Electrical, Mechanical and Civil Engineering and they became fully autonomous in 1965.

For many years after its establishment, the Department of Electrical Engineering that give birth to Electronics and Telecommunications Engineering, like other Departments in the Faculty, offered a 3–year Bachelor of Engineering degree program. With the adoption of the Student Work Experience Program (SWEP) and the Student Industrial Work Experience Scheme (SIWES), it became imperative for the programs to be changed to 4–year degree programs by the 1981/82 session. By the 1991/92 session, the University adopted the Semester System and now all the degree programs in the Faculty are 5–year bachelor degree programs.

During the 2010/11 session, the National Universities Commission, after a Resource Assessment exercise approved the change of name of the Department from Electrical Engineering to Electrical and Computer Engineering. They subsequently approved the splitting of the Department into the Departments of:

i) Electrical Engineering
ii) Telecommunications Engineering
iii) Computer Engineering

In the year 2017, after the successful accreditation of the Department by both the NUC and COREN, the split was actualized and an interim head appointed by the Vice Chancellor in November 2017.

In 2021, the NUC approved the change of name of the Department from Telecommunications Engineering to Electronics and Telecommunications Engineering. Prior to this, the Department got approval for the change of curriculum in 2018.

The Department also offers post-graduate programme leading to the award of PGD in Electronics and Telecommunications Engineering, M.Sc. and Ph.D degrees in Electronics as well as in Telecommunications Engineering.

2.0 JUSTIFICATION FOR THE REVIEW

With the fast growing ICT establishments in Nigeria and the emerging technologies in the areas of Electronics and Telecommunications Engineering made it mandatory to review the curriculum to meet the paradigm shift. Having gone one full circle of the last review of the curriculum of 2018 and in line with Moore’s postulate, it was discovered that there is still need to review and include some emerging fields in the area of Electronics and Telecommunications.

3.0 OBJECTIVES OF THE PROGRAMME

The objectives of the Programme are in line with the **objectives** of the University as articulated in Article 4 of its 1962 and 1975 Laws are:

- ***To provide regular and updated programs and courses in all the fields of Electronics and Telecommunications Engineering of a standard required and expected of a Department and University of the highest standing.***
- ***To educate and equip students with the technical knowledge, skills and competencies to analyze, design, develop, test and produce Electronics and Telecommunications Engineering products and services for the benefit of humanity***.
- ***To promote research and the advancement of all fields of Electronics and Telecommunications Engineering.***
- ***To secure the diffusion of Electronics and Telecommunications Engineering knowledge throughout Nigeria and the world at large.***
- ***To provide technical manpower for the emerging Electronics and Telecommunications industries.***
- ***To impart competencies required to compete nationally and internationally in the field of Electronics and Telecommunications***.

4.0 INTENDED LEARNING OUTCOMES FOR THE PROGRAMME

i. **To apply and analyze the basic principles concepts and important theories of electronics and telecommunication engineering.**
ii. **To configure, evaluate, verify, troubleshoot and test systems, process, components and programs related to electronics and telecommunications**
iii. **To understand, formulate, analyze, optimize and design systems to solve the contemporary problems.**
iv. **To carry out network planning, design and optimization.**
v. **To use techniques, tools for electronics and telecommunication engineering.**
vi. **To equip with necessary knowledge, skills and experiences along with ethical values and professional attitude.**
vii. **To communicate ideas and concepts in an organized manner.**
viii. **To generate fresh ideas and knowledge to solve contemporary and upcoming problems.**
ix. **To work in a team and play role as a team leader.**

5.0 GENERAL REQUIREMENTS

Please find below the requirements for the program

5.1 ADMISSION REQUIREMENTS

i) **Five O' Level** (SSCE / NECO) passes at **Credit** level in subjects which **MUST** include **Mathematics, English, Physics** and **Chemistry** and having offered **English, Mathematics, Physics** and **Chemistry** at UTME and PUTME
ii) At least 2 A' Level passes in Physics and Mathematics or OND/HND at Lower Credit level in Electrical Engineering in addition to (i) are required for Direct Entry Admission.

5.2 DURATION OF THE PROGRAMME

ENTRY LEVEL	DURATION
100 Level	**5 Years**

200 Level	**4 Years**
300 Level	**3 Year**

5.3 GRADUATION REQUIREMENTS

S/N	Level	Total CU
1	100L	38
2	200L	38
3	300L	41
4	400L	26
5	500L	35
TOTAL		**178**

ENTRY LEVEL	**GRADUATION CU**
100L	**178**
200L (DE)	**145**
300L (SPECIAL)	**111**

5.4 EXAMINATION GUIDELINES

a) GUIDELINES

Examinations are normally held at the end of each semester. Examinations may take the form of written papers, orals, practicals, submission of projects, any combination of these or any other form as may be approved by the Senate of the University. The continuous assessment is normally included in determining the final score of any examination.

It shall be the responsibility of each student to make sure that he/she is registered for the appropriate examinations and that he/she knows the dates, times and places of the examination for which he is registered

b) **ELIGIBILITY**

In order to be admitted to any examinations, a student must have been registered for the course to be examined and must have fulfilled University requirements for attendance **(75%)**, residency, fees or other matters. At least 75% attendance is required in all classes, tutorials, laboratories, etc to qualify to sit for semester examination. The student must also have fulfilled any Departmental requirements regarding satisfactory completion of any course work, practicals, assignments, projects or other matters.

c) **CONDUCT**

1. A student shall be at the examination venue at least thirty (30) minutes before the advertised time for the examination.
2. A student is required to supply his own writing and drawing materials, calculator, etc.
3. A student may be admitted up to forty-five (45) minutes after the start of the examination but he shall not be allowed any extra time.
4. A student may be allowed to leave the examination room during the course of an examination provided that:
    i) No student shall normally be allowed to leave during the first hour or last fifteen minutes of the examination.
    ii) A student must hand over his script to the Invigilator before leaving if he does not intend to return.
    iii) A student who leaves the examination room shall not be re-admitted unless throughout the period of his absence, he has been continually under the supervision of the invigilator or security personnel.
5. A student shall bring his ID card and examination card to each examination and display it in a prominent position on his desk.

6. Each student shall complete an attendance form bearing his name, registration number, booklet number and signature which shall be collected by the Invigilator.
7. During an examination, no student is allowed to talk to any other student, or except as essential, to the Invigilator.
8. No book, printed paper or written document or unauthorized aid may be taken into an examination hall by any student except as may be stated in the rubrics of any examination paper.
9. A student must not, during an examination, directly or indirectly give assistance to any other student or permit any other student to copy from or otherwise use his papers.
10. Similarly, a student must not directly accept assistance from any other student or use any other student's paper.
11. If any student is suspected or found to be infringing any of the above provisions or in any way cheating or disturbing the conduct of the examination, a report shall be made immediately after the examination to the Faculty Examination Officer and the Dean. The Dean will cause the circumstances to be investigated by the Faculty Examination Regulations and Irregularities Committee (ERIC) and reported to the Faculty Board.
12. A student shall write his examination number, not his name, distinctly at the top of every page of the examination booklet or separate sheet.
13. The use of scrap paper is not permitted. All rough work must be done in the answer booklet and neatly crossed out. Except for the printed question paper, a student may not remove or mutilate any paper or other materials supplied from the examination room.

d) SCORING AND GRADING SYSTEM

The approved scoring and grading systems (from 2017/18 sessions and 2016/17 and older sessions) are as shown in Tables 1 and 2 respectively

Table 1: Approved Scoring and Grading System (2018/19 Session)

S/N	% Score	Letter Grade	Grade Point	CGPA & Class of Degree
1	70-100	A	5	4.50-5.00 **First Class**
2	60-69	B	4	3.50-4.49 **Second Class Upper**
3	50-59	C	3	2.40-3.49 **Second Class Lower**
4	45-49	D	2	1.50-2.39 **Third Class**
5	40-44	E	1	1.00-1.49 **Pass**
6	0-39	F	0	<1.00 **Fail**

Table 2: Approved Scoring and Grading System (2013/14 to 2017/18 Sessions)

S/N	% Score	Letter Grade	Grade Point	CGPA & Class of Degree
1	70-100	A	5	4.50-5.00 **First Class**
2	60-69	B	4	3.50-4.49 **Second Class Upper**
3	50-59	C	3	2.40-3.49 **Second Class Lower**
4	45-49	D	2	1.50-2.39 **Third Class**
5	40-44 0-39	F	0	<1.49 **Fail**

NOTE

a) A student who has a **CGPA < 1.00** (from Table 1) and **CGPA < 1.50** (from Table 2) for two consecutive semesters is placed on **Academic Probation.**

b) A student who scores a **CGPA < 1.00** or **CGPA < 1.50** (as the case might be) for four consecutive semesters is advised to **withdraw** from the program on academic grounds

Failure **(≤40%** or **≤44%** as the case might be**)** in any course shall be recorded as such and can only be redeemed by re-taking the course as a **carry-over** and passing the examination. However, the initial credit point and the carry-over credit point shall count towards the CGPA. Subject to the conditions for withdrawal and probation as set out, a student may continue to re-take a failed course at the next available opportunity but will not be allowed to register beyond the allowed maximum credit units of **24**.

A student is also registered in the next level depending on the credit units earned (TCUE). A student is eligible for 200L if he has earned **24** credit units, 300L if he has earned up to **48** credit units, 400L if he has earned up to **72** credit units and 500L if he has earned up to **84** credit units.

NOTE:

a) Students are expected to register between a **MINIMUM** of **12** credit units and a **MAXIMUM** of **24** credit units per Semester (except for "spill-over" students who are expected to register their outstanding courses but not exceeding 24 credit units).
b) Students are advised to register their carry-over courses before any new courses.
c) No student will be allowed to register for a course for which the **PREREQUISITE** has **NOT** been passed
d) Any student who is registered (for the first time) as a **400L** student **MUST** participate in the **SIWES** program for that session.

5.5 DEFERMENT

A student is allowed to defer, on a semester basis, his academic programme on any of the following grounds:

a) Health/Medical
b) Financial
c) Academic
d) Any other reasons deemed acceptable by the Department.

It is expected that a student should register first before applying for deferment.

NOTE: Any student who absents himself from School for a semester or two will be deemed to have forfeited those semesters and beyond that the student will be deemed to have voluntarily withdrawn from the programme.

5.6 EXAMINATION IRREGULARITIES AND DISCIPLINARY ACTIONS

The examination regulations bind all students, breach of which carries serious punishments prescribed as follows:

- **EXPULSION**

The following offences shall carry the punishment of expulsion:

1. Impersonation at examinations. This may involve the exchange of examination numbers or names on answer scripts or the intentional use of someone else's examination number (Examinations include Continuous Assessment, Semester Examination, SWEP, SIWES, etc.).
2. Introduction of relevant foreign materials and cheat notes into the Examination Hall.
3. Exchange of relevant materials in the examination hall which may involve:
    i) The exchange of question papers containing relevant jottings and materials, or
    ii) Collaboration/copying from each other, or
    iii) Exchange of answer scripts.

4. Theft/removal of examination scripts or materials from the examination room.
5. Mischief by fire to examination scripts or materials.
6. Copying from cheat notes.
7. Consulting cheat notes outside the examination hall.
8. Facilitating/abetting cheating during examination
9. Use of mobile phones (GSM), text messages and/or other such communication or electronic gadgets during examinations.
10. Life threatening assaults to an invigilator, examination officer or any other constituted authority with evidence.
11. Willful destruction of exhibit (foreign material or cheat note) in the examination hall on the suspicion or on arrest for committing examination malpractice
12. Solicitation for marks or change of grades from the examiner or examination officer.

- **RUSTICATION**

The following offences shall carry the punishment of rustication for one session:

1. Non-submission or incomplete submission of answer scripts.
2. Introduction of non-relevant foreign materials to the examination hall.
3. Non-appearance at the Examinations Regulations and Irregularities Committee (ERIC) until the accused appears before it.
4. If a student refuses to appear after the first year of rustication, it is taken as self-withdrawal.
5. Introduction of mobile phones (GSM) and/or other such communication or electronic gadgets to examinations halls.
6. Any student that insults to an invigilator, examination officer or any other constituted authority during examination.
7. Introduction of fake examination card or identity card in the examination hall.

- **WRITTEN WARNING**

The following offences shall attract a written warning:

1. Speaking/conversation during examinations
2. Writing on question paper
3. Unruly behavior in the examination hall that does not affect the conduct of the examination
4. Failure to write name, registration number, signature on the attendance register

5.7 NOTIFICATION OF RESULTS

Upon submission of results by the examiners, the Departmental Board of Examiners will sit over the results and then pass it on to the Faculty Board of Examiners for deliberations. The results are then forwarded to the Senate of the University for formal approval. However, after the Faculty Board, the results (letter grades, GPA, CGPA) can be released on notice boards, with a proviso **Subject to Senate Approval.** Transcripts of examination results may only be issued on request to institutions of higher education and to institutional sponsors. Statement of results and certificate of the ward of degrees approved by the Senate shall be issued to successful graduates.

6. COURSE STRUCTURE

100 LEVEL

Students must offer a minimum total of **38 credit units** at 100 Level comprising the following: **19 credit units** of core courses in the First Semester and **19 credit units** of core courses in the Second Semester.

FIRST SEMESTER 100L COURSES

S/N	CODE	Title	Status	CU	Prerequisites

1	CHEM101	Introductory General Chemistry	Core	2	-
2	CHEM121	Inorganic Chemistry	Core	2	-
3	CHEM161	Chemistry Practical 1	Core	1	-
4	PHYS111	Mechanics	Core	2	-
5	PHYS131	Heat and Properties of Matter	Core	2	-
6	PHYS161	Physics Practical 1	Core	1	-
7	MATH101	Elementary Set Theory	Core	2	-
8	MATH103	Trigonometry and Co-ordinate Geometry	Core	2	-
9	MATH105	Differential and Integral Calculus	Core	2	-
10	GENS101	Nationalism	Core	1	-
11	GENS103	English and Communication Skills	Core	2	-
		Total		**19**	

SECOND SEMESTER 100L COURSES

S/N	CODE	Title	Status	CU	Prerequisites
1	CHEM112	Introductory Physical Chemistry	Core	2	-
2	CHEM162	Chemistry Practical II	Core	1	-
3	PHYS122	Electricity, Magnetism and Modern Physics.	Core	2	-
4	PHYS124	Geometrical and Wave Optics	Core	1	-
5	PHYS162	Physics Practical II	Core	1	-
6	MATH102	Algebra	Core	2	-
7	MATH104	Conic Sections and Applications of Calculus	Core	2	-
8	MATH106	Vectors	Core	2	-
9	STAT102	Introductory Statistics	Core	2	-
10	COSC101	Programming in Basic	Core	2	-
11	ENGG102	Introduction to Engineering	Core	1	-
12	GENS104	History and Philosophy of Science	Core	1	-
		Total		**19**	

S/N	CODE	Title	Status	CU	Prerequisites
1	GENS102	Environmental Health	Elective	1	-

200 LEVEL

Students must offer a minimum total of **38 credit units** at 200 Level comprising the following: **18 credit units** of core courses in the First Semester and **20 credit units** of core courses in the Second Semester.

FIRST SEMESTER 200L COURSES

S/N	Code	Title	Status	CU	Prerequisite
1	ETEN201	Introduction to Electronic Communications I	Core	1	-
2	ENGG201	Engineering Graphics	Core	2	-
3	ENGG203	Analysis of Structures I	Core	2	-
4	ENGG205	Electric Field and Circuit Theory	Core	2	PHYS122
5	ENGG207	Electric Power, Machine and Installation	Core	2	PHYS122
6	ENGG209	Fundamental of Materials Science	Core	2	-
7	ENGG211	Fluid Mechanics I	Core	2	-
8	MATH241	Calculus I	Core	3	MATH105
9	MATH243	Algebra I	Core	2	MATH102
		Total		**18**	

SECOND SEMESTER 200L COURSES

S/N	Code	Title	Status	CU	Prerequisite
1	ETEN202	Introduction to Electronic Communications II	Core	1	-
2	ENGG202	Engineering Drawing	Core	3	-

3	ENGG204	Strength of Materials I	Core	2	-
4	ENGG206	Fundamental of Dynamics	Core	2	-
5	ENGG208	Basic Thermodynamics	Core	2	-
6	ENGG210	Introduction to Management	Core	1	-
7	ENGG212	Electronics, Measurement and Transducers	Core	2	PHYS122
8	ENGG298	Student Work Experience Programme (SWEP)	Core	0	-
9	MATH242	Calculus II	Core	2	MATH105
10	MATH244	Algebra II	Core	3	MATH102
11	GENS202	Entrepreneurship and Innovation	Core	2	-
		Total		**20**	

300 LEVEL

Students must offer a minimum total of **41 credit units** at 300 Level comprising the following: **21 credit units** of core and cognate courses in the First Semester and **18 credit units** of core and cognate courses in the Second Semester, a minimum of **2 credit unit**s of restricted electives.

FIRST SEMESTER 300L COURSES

S/N	CODE	TITLE	Status	CU	Prerequisite
1	ETEN301	Circuit Theory and Systems I	Core	2	ENGG201
2	ETEN303	Telecommunication Principles	Core	2	ENGG201
3	ETEN305	Analogue Electronics	Core	2	ENGG202
4	ETEN311	Laboratory Practical I	Core	2	-
5	COEN333	Control Engineering I	Core	2	-
6	COEN335	Introduction to Programming	Core	2	-
7	EEEN327	Power Engineering I	Core	2	-
8	MATH341	Diff. Equations and Transforms	Cognate	3	MATH241
9	STAT343	Statistics	Cognate	2	STAT102
10	GENS301	Business Creation and Growth	Core	2	-
		Total		**21**	

SECOND SEMESTER 300L COURSES

S/N	CODE	TITLE	Status	CU	Prerequisite
1	ETEN302	Circuit Theory and Systems II	Core	2	ENGG201
2	ETEN304	EM Fields and Waves	Core	3	ENGG201
3	ETEN306	Fundamentals of Power Electronics	Core	2	ENGG202
4	ETEN308	Measurements and Instrumentation	Core	2	ENGG202
5	ETEN310	Electronics Engineering I	Core	2	ETEN305
6	ETEN312	Communication Power Systems	Core	2	ENGG202
7	ETEN314	Laboratory Practical II	Core	2	-
8	ETEN316	Digital Electronics I	Core	2	ENGG202
9	ETEN318	Technical Writing and Presentation	Core	1	-
		Total		**18**	

RESTRICTED ELECTIVE COURSES

S/N	CODE	Title	Status	CU	Prerequisite
1	COSC344	Programming in Java	Restricted	3	-
2	QTYS309	Development Economics	Restricted	2	-
7	EEEN309	Electrical Machines	Restricted	2	ENGG207

400 LEVEL

Students must offer a minimum total of **26 credit** units at 400 Level comprising the following: **20 credit units** of core and cognate courses in the First Semester and **6 credit units** of SIWES in the Second Semester and Long Vacation.

FIRST SEMESTER 400L COURSES

S/N	CODE	Title	Status	CU	Prerequisite
1	ETEN401	Data Communication	Core	2	ETEN303
2	ETEN403	Microcontroller and Embedded System Applications	Core	2	-
3	ETEN405	Digital Electronics II	Core	2	ETEN307
4	ETEN407	Introduction to Semiconductor Microelectronics	Core	2	-
5	ETEN409	CAD for Electronics Design	Core	2	-
6	ETEN411	Laboratory Practical & Project	Core	2	ETEN311
7	COEN463	Control Engineering II	Core	2	COEN333
8	ENGG403	Law For Engineers	Cognate	1	
9	MATH441	Complex Analysis	Cognate	2	MATH341
10	MATH443	Numerical Analysis	Cognate	3	
		Total		**20**	

SECOND SEMESTER 400L COURSES

S/N	CODE	Title	Status	CU	Prerequisite
1	ENGG498	Student Industrial Work Experience Scheme (SIWES)	Core	6	-

500 LEVEL

Students must offer a minimum total of **35 credit units** at 500 Level comprising the following: **16 credit units** of core courses in the First Semester and **19 credit units** of core courses in the Second Semester.

FIRST SEMESTER 500L COURSES

S/N	CODE	Title	Status	CU	Prerequisite
1	ETEN501	Integrated Circuits and Systems Design	Core	2	ETEN405
2	ETEN503	Telecommunications Networks I	Core	2	
3	ETEN505	Digital Communications	Core	2	ETEN401
4	ETEN507	Electronics Engineering II	Core	2	-
5	ETEN509	Engineering Management and Decision Making	Core	2	-
6	ETEN511	Laboratory Practical III	Core	2	-
7	ETEN513	Reliability and Maintainability	Core	2	-
8	ETEN517	Digital Signal Processing	Core	2	-
		Total		**16**	

SECOND SEMESTER 500L COURSES

S/N	CODE	Title	Status	CU	Prerequisite
1	ETEN502	Wireless and Mobile Communications	Core	2	-
2	ETEN504	Telecommunications Networks II	Core	3	-
3	ETEN506	Optical Fibre Communications	Core	2	-
4	ETEN508	Satellite Communications	Core	2	-
5	ETEN510	Telecommunication Systems Policy and Planning	Core	2	-
6	ETEN514	Teletraffic Engineering	Core	2	-
7	ETEN598	Final Year Project	Core	6	-
		Total		**19**	

ELECTIVE 500L COURSES

S/N	CODE	Title	Status	CU	Prerequisite
1	ETEN512	Digital Switching Systems	Restricted	2	ETEN405
2	COEN554	Web Programming	Restricted	2	-
3	COEN557	Advanced Computer Architecture	Restricted	2	COEN337
4	COEN556	Network Security and Cryptography	Restricted	2	-

ETEN: Electronics and Telecommunications Engineering
COEN: Computer Engineering
EEEN: Electrical Engineering

SUMMARY TABLE (PROPOSED)

S/N	Level	Total CU
1	100L	38
2	200L	38
3	300L	41
4	400L	26
5	500L	35
TOTAL		**178**

ENTRY LEVEL	GRADUATION CU
100L	**178**
200L (DE)	**145**
300L (SPECIAL)	**111**

7. COURSE DESCRIPTION AND LEARNING OUTCOMES FOR EACH COURSE

200 LEVEL
FIRST SEMESTER

ETEN201: INTRODUCTION TO ELECTRONIC COMMUNICATIONS (I)
LEARNING OBJECTIVES

1. To define engineering and the impact of electronic engineering on modern society
2. To identify basic electronic components
3. To understand standard symbols used for basic electronic components
4. To understand the SI units for basic electrical quantities.
5. To identify the basic building blocks of linear and digital integrated circuits
6. To identify and understand the functions of basic electronic measuring equipment
7. To identify and understand the impacts of electronic communications on modern society

COURSE OUTLINE

MODULE I: General Perspectives of Electronic Engineering

State the meanings of: engineering, electrical engineering, electronic engineering, and electronic communication/telecommunications. Describe the relationship between electronics and other branches of electrical engineering.

MODULE II: Services Provided by Electronic Communications

Explain the impact of electronic engineering on modern society**. Broadcasting**: Radio. Television. Telephony, e-commerce, e-education, e-banking, e-medical, e-mail. The Internet, multimedia services, etc

MODULE III: Basic Electrical Components Identification

Basic components identification: Resistor, Capacitor, Inductor, Transistor, Diode, Basic logic gates; AND, NAND, NOT, OR, NOR, Exclusive-OR and their standard symbols of these components. Functions of these components in electrical circuit. State the units of measure of Resistor, Capacitor, and Inductor. Using colour coding to determine the values of resistors.

MODULE IV: Basic Electricity (D.C) -I

Define electric circuit. State the basic concept of a flow of electric current. State the effects of an electric current: heating, chemical, magnetic. Distinguish between electrical conductors and insulators. State the units of current (Ampere), potential difference (Volt), resistance (Ohm). Define the coulomb, Ampere, Volt, and Ohm.

MODULE V: Basic Electricity (D.C) -II

State Ohm's law and use the law to solve simple electrical circuit problems; resistors in series and parallel. Capacitors in series and parallel. Identify the formula for power in a resistive electrical circuit (power = voltage x current). Show that power can also be calculated from I^2 R and from V^2/R . Define the Watt as the SI unit of power. Identify the formula for energy in resistive electrical circuit (energy = power x time)

MODULE VI: A.C Circuits

Describe the relationship between peak, peak-to-peak, average and root-mean-squared (r.m.s) values of sine waves. Explain why r.m.s values are important. Calculate the r.m.s value given the peak, peak-to-peak or average values and vice versa.

MODULE VII: Signal Waveforms

Explain how sound waves are converted into electrical signals by means of a **transducer.** Explain how electrical signals are converted into sound waves by means of a **transducer.** Amplitude, frequency, phase, wave-shape, complex (consisting of a combination of sinusoidal waveforms). Explain the relationship between velocity (v), frequency (f) and wavelength (λ). Describe the factors that affect signals: gain (amplification), loss (attenuation), distortion (shape), frequency, interference, noise

MODULE VIII: Digital Integrated Circuits

State that linear integrated circuits are available for a variety of applications such as: amplifiers, oscillators, comparators, etc. State that digital integrated circuits are available to provide a number of logical functions such as: **AND, OR, NOT, NAND, NOR, Exclusive-OR**

MODULE IX: Basic Measuring Equipment

Describe the principle and use of the following measuring equipment: Ohmeter, Voltmeter, Ammeter, Digital multimeter, Oscilloscope, Spectrum Analyser. Explain the purpose of calibration as a preparatory step before measurements are taken

LEARNING OUTCOMES

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

1. Understand the meaning of electronic engineering and its relationship with electronic communications.
2. Describe the various services provided by electronics and electronic communications
3. Describe the various devices provided by electronics and their applications
4. Identify basic electronic components
5. Identify integrated Circuits
6. Explain the principles and applications of basic measuring equipment
7. Explain the concept of signal

GRADING

1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

200 LEVEL
SECOND SEMESTER

ETEN202: INTRODUCTION TO ELECTRONIC COMMUNICATIONS (II)

LEARNING OBJECTIVES

1. To describe the functions of the main building blocks of generic analogue and digital telecommunications systems
2. To describe the main types of impairments in telecommunications systems and their effects on performance, capacity and bandwidth.
3. To describe the main types of telecommunications transmission media and their limitations
4. To describe the key telecommunications networks/services.
5. To describe radio frequency bands and their applications.
6. To describe the main types of semiconductor diodes and their applications
7. To describe half wave and full wave rectification and explain hy they are used in power supplies
8. To describe transistor action and explain the three method of connecting a transistor in a circuit.
9. To describe solid- state switching circuits such as multi-vibrators. Distinguish between electro-mechanical switches and solid-state switches
10. To describe some key waveform generators

COURSE OUTLINE

MODULE I: Basic Telecommunications Systems
Explain the difference between communications and telecommunications. Describe, using simple block diagrams; analogue and digital communications systems. Explain the advantages and disadvantages of digital communications system. Describe radio frequency bands and their applications

MODULE II: Telecommunications Networks and Services
Describe, using simple block diagrams, the following types of telecommunications services: Telephone network, intelligent network, data communications network, cellular mobile network, internetwork (i.e., Internet), satellite communications network. Radio and TV broadcasting. Explain the meaning of convergence in telecommunications

MODULE III: Types of Impairments in Telecommunications Systems
Describe in simple language, the following types of impairments that occur in telecommunications systems: attenuation, interference, distortion, fading. Explain the effects of these impairments on system capacity, bandwidth and quality of service.

MODULE IV: Types of Telecommunications Transmission Media
Explain the difference between guided and unguided transmission media. LIST the types of guided and unguided transmission media. Describe their performance and limitations in terms of coverage distance, losses, and frequency of operation.

MODULE V: Semiconductor Diodes
List and describe main types of semiconductor diodes and their applications. Describe, using a simple schematic circuit diagram, for measuring the current/voltage characteristics of a semiconductor diode. Describe the following special-purpose diodes: Light Emitting Diode (LED), photo diode, variable diode

MODULE VI: Power Supplies:
Explain the meaning of **rectification** in the context of operation of electronic and radio equipment. Describe, using simple schematic diagrams, the following rectifier circuits: (i) halfwave rectifier; (ii) full wave rectifier. Describe the relationship between peak, peak-to-peak, average and root-mean-squared (r.m.s) values of sine waves. Explain why r.m.s values are important. Calculate the r.m.s value given the peak, peak-to-peak or average values and vice versa.

MODULE VII: Transistors
Describe, in simple language, the action of a transistor. Explain the following basic ways of connecting a transistor in a circuit: (i) common-base connection; (ii) common-emitter connection; (iii) common-collector connection.

MODULE VIII: Waveform Generators
Describe a simple L-C oscillator circuit. Explain how frequency stability is achieved

MODULE VIII: Solid-State Switching Circuits
Compare and contrast between mechanical switch, electro-mechanical switch and electronic switch. Describe, in simple language, the multi-vibrator action. LIST the main types of multi-vibrators.

LEARNING OUTCOMES
At the end of the course, the students will be able to:
1. Understand and describe and explain all the elements in modules I to VIII.

Grading
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ENGG202: ELECTRONICS, MEASUREMENTS AND TRANSDUCERS

OBJECTIVES:
1. To understand the types of materials in terms of electrical conductivity
2. To understand how electronics components are designed (diodes, LED, BJT and FET)
3. To understand how electronics components are used in design of electronic circuits (rectifiers, amplifiers, oscillators switches)
4. To be able to carry out laboratory practicals using electronic components
5. To understand basics of measuring instruments (Ammeter, Voltmeter, Wattmeter)
6. To understand the fundamentals of transducers and their applications

MODULE I: ELECTRONIC MATERIALS
Electronics; charge particles and atomic structure of matter; energy levels in an atom; energy band theory of solids (conductors, insulators, semi-conductors); conductivity in solids; conductivity in semiconductors (intrinsic; extrinsic); mass-action law and carrier concentrations; transportation of electric current; drift in an electric field and diffusion due to temperature effect.

MODULE II: DIODES (PN JUNCTION) DEVICES
PN junction diode and its formation; forward-biased; reverse-biased; diode current and voltage relationship; operation of diode; avalanche and Zener breakdown; applications of diodes (rectification; voltage doubling; clipper (limiter); clamper; light emitting diode; two color LED emitter; applications of LEDS; photodiode; Zener diode)

MODULE III: BIPOLAR JUNCTION TRANSISTORS
Bipolar Junction Transistor: Transistor Circuit; Common-Emitter (CE); Configuration; Common-Base (CB) Configuration; Common-Collector (CC) Configuration. Transistor Operation Parameters, Applications of Transistor: Amplifier; Oscillator; Switch

MODULE IV: JUNCTION FIELD-EFFECT TRANSISTOR (JFET)
Junction FET (JFET); N-Channel JFET Operation; P-Channel JFET Operation; Transfer Characteristics of JFET; JFET Specification Sheet

MODULE V: MEASUREMENTS & TRANSDUCERS
General principle of measuring instruments. Torques and spring relationship. Types of instrument: Ammeters, Voltmeters, Wattmeters, Watt-hour-meters.
Transducers and Bridge measurements: Measurement of resistance, measurement of frequency. Electrical pressure transducers. Displacement transducers. Electrical temperature transducers. Measurement of speed by electrical means.

LABORATORY PRACTICALS
1. Experiment on half-wave and full-wave rectifier circuits
2. Simple transistor amplifier circuit
3. Simple audio amplifier circuit

LEARNING OUTCOMES
Upon successful completion of the course, students should:

1. Know the different types of materials in terms of electrical conductivity
2. Know how electronics components are designed (diodes, LED, BJT and FET)
3. Know how electronics components are used in design of electronic circuits (rectifiers, amplifiers, oscillators switches)
4. Carry out laboratory practical using electronic components
5. Know basics of measuring instruments (Ammeter, Voltmeter, Wattmeter)
6. Know the fundamentals of transducers and their applications

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

300 LEVELS
FIRST SEMESTER

ETEN301: CIRCUIT THEORY AND SYSTEMS I
OBJECTIVES:

1. Review of Network theorems and Topologies.
2. Introduce First order and second order circuits transient response, testing signals, different signals
3. students shall understand frequency domain analysis, complex number phasors, rotating phasor, impedance and admittance.
4. Students shall understand how to make use of series circuits of fixed resistance and variable of reactance, locus and phasor diagrams.
5. Students shall understand transmission line parameters.

MODULE I: TRANSIENT RESPONSE OF FIRST AND SECOND ORDER CIRCUITS

Test signals: Exponential function, sinusoid, unit step unit impulse, and complex exponentials. First order circuits; RL and RC circuits driven by initial conditions and by test signals; Classical solutions and operator method; Use of Laplace transform method and convolution techniques; Numerical solutions; Second Order circuits; RLC circuits driven by initial conditions and by test signals; Solutions using Laplace transforms; Over-damped, critically damped and under-damped responses; State equations; Numerical solution of state equations.

MODULE II: SINUSOIDAL STEADY-STATE ANALYSIS

Frequency-domain analysis; Complex number phasors and rotating phasors; Steady-state response; Impedance and admittance; Mesh and Nodal equations; Power factor and power factor correction; Power and maximum power theorem.

MODULE III: LOCUS AND PHASOR DIAGRAMS

Series circuits of fixed resistance and variable reactance and vice versa; Z and Y plane locus; Current locus diagrams; Δ-Y transformation theorem and phasor diagrams; Δ-Y 3-phase transformer connections using three single-phase transformers.

MODULE IV: TRANSMISSION LINES

Review of transmission line parameters; Types of power transmission lines and their circuit representations.

LEARNING OUTCOMES

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

1. Know the difference between first order and second order transient responds of the circuits
2. Know the RL and RC circuits initial conditions, use Laplace transform and convolution techniques to solve circuit problem and test signal flow in the circuit.
3. Know complex number phasors and rotating phasors.
4. Know steady state response, impedance and admittance of the circuit.
5. Use mesh and nodal analysis to solve circuit current flow
6. The types of power transmission lines and their circuit representations

GRADING

1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN303: TELECOMMUNICATIONS PRINCIPLES
OBJECTIVES:

1. Introduce the different telecommunication networks and the function of their constituents
2. Introduce signal modulation and the properties of communication links.
3. Explain the principle behind the conversion of information signals between digital and analog forms
4. Introduce the concept and type of signal multiplexing
5. Introduce the need for and methods used for error control over communication links
6. Introduce radio communication systems
7. Introduce metrics for telecommunication system performance evaluation

MODULE I: OVERVIEW OF TELECOMMUNICATIONS SYSTEMS

In this module, students will be introduced to different telecommunications system networks, components and functions of different subsystems of a communications link, and limitations of a communication link.

MODULE II: SIGNAL MODULATION AND TRANSMISSION (ANALOG AND DIGITAL)

This module will explain and analyze basic analogue and digital modulation techniques. It will also explain the transmission power and bandwidths requirements and the use of the decibel (dB) unit of measure of power.

MODULE III: INFORMATION SIGNAL TRANSMISSION
Module three will introduce students to the principles of analog/digital signal conversion over a digital/analog transmission link.

MODULE IV: SIGNAL FLOW AND MULTIPLEXING
This module will explain flow control and basic multiplexing techniques (i.e., FDM, TDM, CDM).

MODULE V: ERROR CONTROL
The principles of error detection and correction will be explained in this module. Simple error detection and correction techniques will be introduced.

MODULE VI: RADIO SYSTEMS, TRANSMITTERS, RECEIVERS AND FILTERS
This module will introduce students to the propagation of radio waves and components responsible for controlled quality signals transmission and reception.

MODULE VII: PERFORMANCE EVALUATION OF TELECOMMUNICATION SYSTEMS
This module will explain the main factors which limit the spectral performance of telecommunications systems (i.e., noise, bandwidth, power). It will introduce students to the analyses of signal-to-noise ratio (SNR), bit error rate (BER), energy per bit to noise spectral density$\left({}^{E_b}/_{N_o}\right)$.

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Identify and describe the functions of the main building blocks of a generic telecommunications system.
2. Understand the principles of analogue and digital modulation techniques and multiplexing.
3. Evaluate system performance in terms of SNR and BER.

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN305: ANALOGUE ELECTRONICS
OBJECTIVES:
1. To know the process of electronics components material processing
2. To know the fundamentals of diodes design, types, operation and applications
3. To know the fundamentals of BJT and JFET and MOSFET transistors design and application
4. To know the fundamentals of fabrication of electronics components

MODULE I: ELECTRONIC MATERIALS
Atomic structure of matter, Energy levels in an atom, Energy band theory of solids, Conductors, Insulators, Semi-conductors, Conductivity in crystalline solids, Conductivity in semiconductors, Intrinsic semiconductors, Extrinsic (doped) semiconductors, Mass-action law and carrier concentrations, Transportation of electric current, Drift in an electric field, Temperature effect

MODULE II: DIODES (PN JUNCTION) DEVICES
Formation of PN junction, Diode current and voltage relationship, Operation of diode, Avalanche breakdown, Zener breakdown, Temperature effects on diodes, Power capacity of diodes, Capacitance of diodes, Definition of some terms, Applications of diodes, Voltage rectification, Half wave rectifier and Full wave rectifier, Voltage doubling, Diode as clipper (limiter), Diode clipper classifications, Diode as clamper, Schoktty diode, Introduction to light and emitted photons (light), Light emitting diode, Operation and light emission process of LED, LED biasing process, LEDS seven segment display, Two colours led emitter, Applications of LEDs, Photodiode, PN photodiode, PIN photodiode, Avalanche photodiode, Photodiode operation modes, Zener diode, Zener regulator

MODULE III: BIPOLAR JUNCTION TRANSISTORS
Photo transistor, Bipolar junction transistor, Transistor circuit, Common-emitter (CE), configuration, Common-base (CB) configuration, Common-collector (CC) configuration, Transistor operation parameters, Applications of transistor, Transistor as an amplifier, Transistor as an oscillator, Transistor as a switch

MODULE IV: FIELD EFFECT TRANSISTOR (JFET & MOSFET)
Junction FET (JFET), N-channel JFET operation, P-channel JFET operation, Transfer characteristics of JFET, JFET specification sheet, Metal-oxide semiconductor FET (MOSFET), N-channel MOSFET, P-channel MOSFET, Enhancement type of N-channel MOSFET, Enhancement type of P-channel MOSFET

MODULE V: BIASING AND APPLICATIONS OF FETs, SILICON CONTROLLED RECTIFIER
FET Biasing, Fixed Bias Configuration, Self-Bias Configuration, and Voltage-divider Biasing Configuration, Applications of field effect transistors: FET as a voltage controlled variable resistor, JFET as a voltmeter, JFET as a timer network, MOSFET as relay driver, Silicon control rectifier (SCR), Operation of SCR, Applications of SCR, SCR as automatic battery charging control, SCR control of full-wave bridge rectifier

MODULE VI: FABRICATION OF ELECTRONIC DEVICES
Fabrication techniques, Fabrication materials, Fabrication procedure, Preparation of base intrinsic materials, Growth of crystal, Oxidation, Etching, Diffusion, Fabrication of transistors, Fabrication of diodes, Fabrication of resistors, Fabrication of capacitor, Photo masking, Metallic connections, IC packaging

LABORATORY PRACTICALS
1. Simple analog and digital circuit implementation experiments with emphasis on the block diagram of the IC used
2. Boolean functions implementation experiments using digital MOS ICs
3. Timing circuits experiments using timer ICs (555-Timer)

LEARNING OUTCOMES
At the end of this course the students are expected to:

1. Understand the process of electronics components material processing
2. Understand the fundamentals of diode design, types, operation and applications
3. Understand the fundamentals of BJT and JFET and MOSFET transistors design and application
4. Understand the fundamentals of fabrication of electronics components

GRADING
3. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
4. Semester Examination (60%)

300 LEVEL
SECOND SEMESTER

ETEN302: CIRCUIT THEORY AND SYSTEMS II
OBJECTIVES:

1. Students shall understand the concept of network functions, poles, and zeros to facilitate the analysis of transfer functions, poles, zeros and pole-zero diagram and also reliability of driving point function, frequency and resonance responses.
2. Student shall understand two-port network parameters Z Y and H
3. Student shall understand the concept of Fourier method analysis of the two-port networks
4. Student shall understand the fundamental of analog communication systems

MODULE I: NETWORK FUNCTIONS, POLES AND ZEROES
Driving point impedance of a one-port network; Transfer functions' Poles, zeroes and pole-zero diagrams; Positive real functions; Realizability of driving point function; Foster and Cauer's methods of synthesis; Frequency responses and resonance.
MODULE II: TWO- PORT NETWORKS
Two-port network parameters: Z, Y and h parameters; Reciprocity relations for reciprocal two ports; Measurement of the parameters; Transmission (chain) parameters; Cascaded chain parameters; Image impedance for symmetrical two-ports; Filter characteristics: low, high and bandpass characteristics; Design of constant K and m-derived filter section; Insertion loss; Two-port network synthesis.
MODULE III: FOURIER METHODS OF ANALYSIS
Fourier series with application to representation of non-sinusoidal signals; Fourier transforms and response of linear networks; Power (or energy) spectra; Analysis and synthesis of non-linear dynamic circuits; Application of computers in the analysis and synthesis of linear and non-linear circuits; Convolution. Auto and cross-correlation
MODULE IV: ANALOG COMMUNICATION SYSTEMS
Random and discrete signal; Autocorrelation functions; Power spectral densities; Bandwidth of different signals: Speech, pictures, fax etc
LEARNING OUTCOMES
Students that successfully complete this course should be able to:

1. Understand one port network
2. Understand two-port network parameters
3. Use Fourier method to analyze two port network, Fourier transforms and response of linear networks.
4. Understand random and discrete signals, bandwidth of different signals

GRADING

1 Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2 Semester Examination (60%).

ETEN304: ELECTROMAGNETIC FIELDS AND WAVES
Aim: Introduce the fundamental properties of electromagnetic fields in an engineering context.

OBJECTIVES:

1. Students shall understand the concept of vector analysis to facilitate the analysis of Electric and Magnetic fields and also use vector calculus and other mathematics to describe electromagnetic phenomena.
2. Students shall be able to state and explain the laws and principles of electric, magnetic, and electromagnetic fields.
3. Students will be introduced to some fundamental concept of electricity and magnetism to form a bridge between circuit theory to the transmission lines, waves and wireless systems, in order to solve problems in electrostatic, magnetostatic, and electromagnetic fields, that describe the principles of operation of several electrical, magnetic, and electromagnetic devices.
4. Students will be introduced to some areas of applications of electromagnetic fields and waves.
5. Understand the principles and applications of time - varying electro-magnetic Fields

MODULE I: REVIEW OF VECTORS
Review of Vector Laws and Vector Analysis, Use of vector algebra in Cartesian, Cylindrical, and Spherical coordinate systems. Vectors Transformation between the three primary coordinate systems. Gradient of a scalar function and the divergence and curl of a vector function in any of the three primary coordinate systems. Application of the divergence theorem and Stokes's theorem.

MODULE II: REVIEW OF EM LAWS
Gauss law. Ampere's law and Faraday's law; Review of EM laws in static and dynamic states. Quasi-stationary magnetic fields. Electric and magnetic problems and solutions. Derive Maxwell's equations in both differential and integral forms. Apply EM laws and Maxwell's equation to solve wave equations in free space and in lossless medium. Explain practical applications of these laws

MODULE III: UNIFORM EM PLANE WAVES:
Magnetic fields in and around current carrying conductors; Conduction and displacement currents; Derivation of Maxwell's equation in curl form from Faraday's and Ampere's laws; Time varying electric and magnetic fields in free space; The wave equation; Plane waves in vacuum, dielectric conducting and lossy media; Skin effect; Polarization of waves; Poynting's vector and energy propagation in free space; Discuss Electric fields of two-electrode configurations. Explain Field distribution in air-gaps Boundary conditions; Plane waves in unbounded dielectric media; Reflection and transmission of plane waves. Eddy currents and braking power.

MODULE IV: EM RADIATING SYSTEMS
Antennae: isotropic antenna, elementary dipole near the far fields; Antenna parameters; Half-wave antenna; Practical antenna e.g. loop, horn and parabolic.

MODULE V: WAVE-GUIDES
Wave-guides: E and H wave modes. Field patterns in rectangular wave-guides. Propagation characteristics. Modes in Rectangular Waveguides, energy flow and attenuation; Explain Resonant cavities and Optical Fibers**:** Field at the surface and within a conductor, cylindrical cavities and waveguides

MODULE VI:
Schwartz problems and Christoffel transformation; Numerical analysis and Simulation.

LEARNING OUTCOMES
Students that successfully complete this course should be able to:
1. Understand how vector analysis can be used to facilitate the analysis of Electric and Magnetic fields. OR Use vector calculus and other mathematics to describe electromagnetic phenomena.
2. Explain basic laws that govern Electromagnetic fields and waves.
3. Apply the laws and principles of electricity and magnetism in solving practical problems in electromagnetic fields.
4. Explain some areas of applications of electromagnetic fields and waves.
5. Understand the principles and applications of time - varying electro-magnetic Fields and be familiar with Maxwell's equations
6. Understand Poynting's theorem and the conservation energy and momentum
7. Understand the principles of propagation of waves in a guided media
8. Understand Schwartz and Christoffel transformation and expose students to some EM simulations software
9. To understand a typical application of Electromagnetic phenomena as in Eddy currents and braking power system.

PRACTICAL
1. Electric fields Experiments-The Cenco Overbeck Apparatus
2. Map Electric fields and equi-potentials for three electrodes

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN306: FUNDAMENTALS OF POWER ELECTRONICS
OBJECTIVES:
1. Students shall understand fundamental of semiconductors theory, PN junctions, transistors and thyristor
2. Students shall understand silicon-controlled rectifiers, their characteristics and operational principles
3. Students shall understand the concept of Triacs, gate characteristics and phase controlled using triacs
4. Students shall understand the concept of other power electronics devices, Schotstky diode, Diac and silicon-controlled switch
5. Students shall understand the concept of transistor switches
6. Students shall understand how to rotect semiconductors devices using snubber circuits.

MODULE I: REIEW OF SEMICONDUCTORS THEORY

Review of semiconductor theory. PN junctions transistors and thyristors.

MODULE II: SILICON CONTROLLED RECTIFIERS

Constructional details, characteristics and principle of operation. Transistor analogy. Methods of turning-OFF. Device specification. Gate characteristics (gate circuit parameters, measurement of device parameters, circuits for gate triggering). Internal power dissipation and temperature rise. Series operation of SCRs. Parallel operation. String efficiency. Protection

MODULE III: TRIACS

Theory of operation. Gate characteristics Turn- On methods. Phase control using Triacs

MODULE IV: OTHER POWER ELECTRONIC DEVICES

Schotsky diode. Diac. Silicon controlled switch. GTO, UJT and relaxation oscillators. Programmable UJT. Unilateral and bilateral switches. Solar switching devices.

MODULE V: TRANSISTOR SWITCHES

Analysis of circuits using transistors as switches

MODULE VI:

PROTECTION OF SEMICONDUCTOR DEVICES

Snubber circuits etc.

Learning Outcomes

Students that successfully complete this course should be able to:

1. Understand the operational principal of semiconductors
2. Understand construction details, characteristics and principal of operation of transistors
3. Know the methods of turning OFF, device specification, gate characteristics and internal power dissipation.
4. Know the concept of TRIACS
5. Know schotsky diode, silicon-controlled switch programmable UJT, unilateral and bilateral switches and solar switching devices

GRADING

1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN308: MEASUREMENTS AND INSTRUMENTATION

OBJECTIVES:

1. Students shall be introduced to various methods for measurement and display of instrument readings.
2. Students shall be able to differentiate between analogue and digital instruments used for measurements.
3. Students shall be introduced to transducers, their classification, types and characteristics.
4. The students shall be able to differentiate between DC and AC potentiometer, and DC and AC bridges.

MODULE I: MEASUREMENT METHODS

This module covers measurement methods, Analogue techniques. Comparison techniques. Substitution methods. Null methods. Digital methods.

MODULE II: DISPLAY METHODS

This module covers the various display methods for instrumentation. Analogue methods. Pointer instruments. Graphical instruments. And Digital methods.

MODULE III: ACCURACY

ACCURACY: Values and uncertainty. Errors. Summation of errors. Random errors. Specifications and standards. Calibration procedures.

MODULE IV: INPUT CHARACTERISTICS

INPUT CHARACTERISTICS: Sensitivity scaling and matching.

MODULE V: WAVEFORMS

WAVEFORMS Sine-wave. Mean value. rms value. form factor and crest factor. Phase relationships. Bias. Harmonics. Frequency effects. Bandwidth. Rise time. Interference: environmental and coupled.

MODULE VI: ANALOGUE INSTRUMENTS

ANALOGUE INSTRUMENTS Moving coil instruments. Electrodynamics instruments. Other pointer instruments. Energy meters. The cathode-ray oscilloscope. Tape recorders.

MODULE VII: COMPARISON METHODS
COMPARISON METHODS: DC and AC potentiometers. DC and AC bridges.

MODULE VIII: DIGITAL INSTRUMENTS
DIGITAL INSTRUMENTS Counters. Multi-function digital voltmeters. DAC and ADC conversions. Sample and Hold circuits. Wave analyzers.

MODULE IX: TRANSDUCERS
TRANSDUCERS: Classification, types and characteristics: To cover various methods of converting various signals into electrical variable.

Learning Outcomes
Students that successfully complete this course should be able to:

1. Understand the various measurement and display methods used for reading electrical/electronic instruments.
2. Know the difference between analogue and digital measuring instruments in terms of their basic mode of operation
3. Explain Transducers, their classifications, types and characteristics.
4. Know the comparison methods using DC and AC potentiometers and DC and AC bridges.

GRADING
Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
Semester Examination (60%)

ETEN310: ELECTRONICS ENGINEERING I
OBJECTIVES:

1. Students shall understand the various types of power supply, configurations, rectification and waveforms.
2. Students shall be able to know the architecture, characteristics and configuration of BJT. They will be able to analyze bot DC and AC load lines.
3. The principle of operation, constructions details and characteristics of FET amplifiers with graphical analysis shall be known by the students.
4. The student will be introduced to cases of amplifiers, distortion and harmonics with analysis of power output and efficiency.
5. Students shall be introduced to the basic characteristics of Op-Amp and their different configurations.
6. Students shall be able to know the concept and effect of feedback on gain, distortion, bandwidth, input and output impedances. The student should also know the types of oscillators with details on them.

MODULE I: POWER SUPPLIES
This module will present the various types of power supply, configurations, rectification and their respective waveforms.
MODULE II: BJT AMPLIFIERS
This module will expose the students to the BJT construction, operational characteristics and configurations. It will also introduce the student to Operating point, DC and AC load lines, Biasing circuits, Bias stability and stability factor. Moreover, thermal runaway, classification of cascaded amplifiers, gain-bandwidth product, RC and transformer coupling will be learned in addition to the low, medium and high-frequency equivalent circuits, Small-signal T- and h-parameter equivalent circuits and Design of BJT amplifiers.
MODULE III: FET AMPLIFIERS
This module shall introduce the student to various Constructional details and characteristics of JFETs and MOSFETs, RC coupled JFET and MOSFET amplifiers. The students will also be introduced to the functions of the circuit component, graphical analysis for DC and AC load lines and different biasing arrangements.
MODULE IV: AUDIO POWER AMPLIFIERS
The module introduces the student to the classes of amplifiers, amplifier distortion and harmonics. It also exposes the student to the power output and efficiency of amplifiers, push-pull amplifiers and complementary symmetry are also explained.

MODULE V: OPERATIONAL AMPLIFIERS
The module shall introduce the basic Op-Amp characteristics and circuits to the student. Difference types of amplifier circuits and configurations will also be explained. Finally, the module will bring about the idea of analog computation.
MODULE VI: OSCILLATORS
The module shall introduce the student to feedback concepts, the effect of feedback on gain, distortion, bandwidth, input and output impedances and various feedback circuits. The various types of oscillators and analysis on them will be introduced as well.
Learning Outcomes
Students that successfully complete this course should be able to:

1. Understand how the various power supplies, configurations, types of rectifications and waveforms are with basic analysis on them.
2. Know the architecture, characteristics and configuration of BJT and be able to analyze DC and AD load line.
3. Explain the principle of operation, constructions and characteristics of FET amplifiers. The student should also be able to know how to analyze the FETs graphically.
4. Know cases of amplifiers distortions and harmonics and can be able to analyze their power output and efficiency.
5. Know the characteristics of Op-Amp and their different configurations.
6. Know the concept and the effect of feedback on gain, distortion, bandwidth, input and output impedances and type of oscillators.

GRADING
Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
Semester Examination (60%)

ETEN312: COMMUNICATION POWER SYSTEMS
OBJECTIVES:
Students shall:

1. Understand the importance of Communication power system
2. Understand energy storage system (Electrochemical batteries), their classification and mode of operation.
3. Be familiar with inverter and converter principle of operation, Classification of inverter and converter, precautions for using an inverter and converter, functions and performance of an inverter and converter, operation of stabilizer and digital power supply.
4. Understand the principle of operation of frequency generation circuits.
5. Understand design and operation of Photovoltaic power system, and converter.
6. Understand the concept of AC and DC power and load connection.

MODULE I: INTRODUCTION
Communication power system requirements and applications. Ampere-Hour capacity, etc
MODULE II: EXCHANGE POWER PLANT
Energy storage. Types of cells: Lead-acid storage batteries, alkaline storage batteries, enclosed cells, glass box cells. Evaluation of selected secondary batteries: electrical, operational and comparative characteristics. Maintenance of storage batteries. Maintenance modes. Charging of storage batteries. Charge-discharge mode. Standby and buffer modes of operation. Charging devices. Semiconductor AC-DC converters (rectifiers). Motors. Generators

MODULE III: PRINCIPLES OF INVERTER CIRCUITS
Controlled rectifier: theory and characteristics. Inverter principles (rectification, inversion, etc). Mechanical and transistor switch inverters. Phase controlled rectifiers and AC line voltage commutated inverters. Series, parallel capacitor commutated inverters. Inverter voltage control. Improving inverter output waveform. DC-DC inverter-rectifier. Time ratio control (TRC). Variable frequency TRC. Constant frequency TRC. Converter for stepping up voltage. SCR DC-DC power converters (push-pull, flyback and forward converters.). AC-DC converter design. Power supplies using ICs. DC-DC high voltage power supply. DC-DC supply with multiple outputs. SCR voltage stabilizer. Special purpose power supplies: digital power supplies. Uninterrupted power supplies (UPS) block schematics. Programmable power supplies.

MODULE IV: PHOTOVOLTAIC GENERATORS
Elements of photovoltaic power systems. Fabrication of cells. Design of a converter.

MODULE V: POWER AND LOAD CONNECTIONS
Power board. AC supply leads and standards. AC common and grounding leads. Isolation transformer. AC line regulation. Load connections: DC output characteristics. DC distribution terminals (DT). Decoupling capacitors. Ground return points.

LEARNING OUTCOMES
Students that successfully complete this course should be able to:
1. Describe the significance of communication power system to the fields of Electronics and Telecommunications Engineering.
2. Explain energy storage system (Electrochemical batteries), their classification and mode of operation.
3. Explain inverter and converter principle of operation, Classification of inverter and converter, precautions for using an inverter and converter, functions and performance of an inverter and converter, operation of stabilizer and digital power supply.
4. Explain Photovoltaic power system, and design a simple converter.
5. Explain the concept of AC and DC power and load connection.

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
   Semester Examination (60%)

ETEN316: DIGITAL ELECTRONICS I

OBJECTIVES:
The course shall provide students with:
1. Understanding of Evolution of digital computer
2. Knowledge of Data representation in computer System
3. Analysis of Boolean Algebra
4. Minimization Techniques

MODULE 1
INRODUCTION: Evolution of the digital computer; Computer classifications; Organization and functions of the major parts of the Computer.

MODULE II
DATA REPRESENTATION IN COMPUTER: The binary number system and arithmetic; One's and two's complement arithmetic; Addition with negative numbers, carries and overflow; Sign and magnitude notation; Representation of non-numeric data; The ASCII character set; Text encoding and string; Alphanumeric ordering; Representation of fractional numbers; Radix conversion; Rounding; Floating-point representation; BCD representation and arithmetic.

MODULE III
BOOLEAN ALGEBRA: Review of elementary digital concepts; switching properties of electronic devices; switching and wave-shaping circuits; Logical variables, functions and standard forms; Min-term and Max-term designation of functions.

MODULE IV
MINIMIZATION TECHNIQUES: Calculus; K-maps; Quine-Macluskey technique; Veitch maps.

Learning Outcomes

By the end of the course students should be able to:
1. Have the knowledge of computer evolution, classifications and organization.
2. Know how data are being represented in a computer system in the form 1's and 0's
3. Synthesize Boolean problems,
4. Design Switching and wave-shaping circuits

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN318: TECHNICAL WRITING AND PRESENTATION

OBJECTIVES:
1. To introduced students to use of effective communication and professional use of English language.
2. To develop technical writing and oral presentation of technical ideals.
3. To understand and develop skills for effective report writing, use of referencing tool and citation.
4. To introduced students to research publications, results presentation and interpretation.

MODULE I
Principles of effective communication; Professional use of the English language; Principles of technical writing.

MODULE II
Oral presentation of technical ideas; Application of presentation software (e.g. Microsoft PowerPoint, etc).

MODULE III
Project and Research: Report writing, Citation and Referencing, Referencing tools and Software, Set-up of experiments/research.

MODULE IV
Introduction to research publications; use of Software for analysing results (Graphs); Plagiarism and plagiarism Software; use of software for circuit design and implementation.

MODULE V
Component of technical research, project/concept design, flowchart.

LEARNING OUTCOMES
1. To understand the Principles of effective communication. Professional use of the English language. Principles of technical writing.
2. To understand oral presentation of technical ideas. Application of presentation software (e.g. Microsoft PowerPoint).
3. To understand report writing, citation and referencing, referencing tools, set-up of experiments/research.
4. Understand research publications, use of Excel in analysing results (Graphs). Plagiarism and its consequences.

400 LEVEL
FIRST SEMESTER

ETEN401: DATA COMMUNICATION
OBJECTIVES:
1. Students should understand the information theory.
2. Understand the baseband digital communication
3. To examine and understand error detection and correction
4. Understand the band pass digital transmission
5. Understand signals and transmission media
6. Understand OSI and TCP/IP reference models
7. Understand data communication networking

MODULE I: INFORMATION THEORY
Students should understand the basics of information measure, entropy and information rate.
MODULE II: BASEBAND DIGITAL COMMUNICATIONS
The module will expose students to understand digital signalling format, line encoding, errors in digital transmission and error models
MODULE III: ERROR DETECTION AND CORRECTION
This module introduces students to coding theory, abstract algebra, source coding and channel coding. The module also covers classification of codes, ARQ systems and FEC systems.
MODULE IV: BANDPASS DIGITAL TRANSMISSION
This module introduces students to various modulation techniques. It also provides the students with basic performance of modulation in fading channels as well as criteria governing modulation selection.
MODULE V: SIGNALS AND TRANSMISSION MEDIA
In this module, students will be exposed to types of signals and how analog and digital data can be transmitted over the media. It also introduces students to various forms of guided and unguided media and the mode of signals propagation in the media
MODULE VI: PROTOCOLS ARCHITECTURE
This module will introduce students to the need of protocol architecture, OSI and TCP/IP reference models and their architectures, standardization within the OSI framework. It also exposes students to the TCP/IP layers TCP and UDP, operation of TCP and IP and also their application
MODULE VII: DATA COMMUNICATION NETWORKING
This module will expose students to wide area networks, wireless area networks, local area networks and metropolitan area networks.
LABORATORY PRACTICALS
1. Frequency shifting principle
2. Digital to analog conversion

LEARNING OUTCOMES
By the end of this course students should be able to:
1. Understand the fundamentals concepts of data communication.
2. Identify different components of data communication and their respective role in computer communication.
3. Apply the knowledge and concepts related to data communication.
4. Design a data communication link.
5. Solve problems related to data communication by choosing suitable techniques.
6. Appreciate the usefulness and importance of computer communication in our lives.

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN403: MICROCONTROLLER AND EMBEDDED SYSTEM APPLICATIONS

OBJECTIVES:
1. Understand basic principles of embedded electronics & microcontroller technology
2. Give background knowledge to those who wish to attend our advanced course
3. Identify applications of the microcontroller in academia and industries
4. Provide students with knowledge and skills for solving problems with microprocessors/ microcontrollers

5. Develop simple home automation systems and industrial application
6. To have a general idea of drafting the proposal, project design, prototype and a term paper.

MODULE I: INTRODUCTION TO COMPUTERS AND MICROCONTROLLERS

This module will present the architecture of a general purpose computer, the difference between microcomputer, microprocessor and microcontroller. The history and evolution of Intel Processors and microcontrollers will also be presented. The students will understand the basic components of a computer system as well as the detailed description of selected microcontroller development environment. The student shall also understand the CPU, memory, parallel I/O, and Serial I/O. The module would explain the pins layout, ports, memories and other general-purpose features and functions of the 8051 families. The students would be expected to draft:

MODULE II: SOFTWARE

The module introduces the instructions set of 8051, Basic operations would be discussed along the line with the loops, stack and data storing techniques. To cave it up, the students would be put through short programming examples.

MODULE III: ADDRESSING MODES

This module would explain in detail the immediate, register, direct, indirect & other addressing modes for assembly language programming. The students would be expected to draft:

MODULE IV: TIMERS/COUNTERS

This module would give an in-depth explanation of the modes of timers/counters, 16-bit mode, 8-bit auto-reload mode. The student will also be able to understand the program examples for timers in different modes and how to carry out testing in the simulator.

MODULE V: INTERFACING TECHNIQUES

This module will provide the student with an introduction to interrupts such as the hardware and software interrupts timer interrupts and serial interrupt. The general difference between parallel and serial interfacings would be discussed. Both serial interfacing modes, baud rate would be discussed. Programming examples for data transmit and receive will be presented with hardware interfacing circuits. The student will also be familiar with the following interfacing: interfacing ADC & DAC with a microcontroller, interfacing the I/O devices, interfacing the external memory, interfacing with PC using the serial port. The students would be expected to draft:

MODULE VI: APPLICATION OF MICROCONTROLLERS

This module is expected to test the student ability in the application of microcontrollers in final year projects and industrial applications. The students would be expected to draft:

LEARNING OUTCOMES

Students that successfully complete this course should be able to:

1. Understand the architecture of the computer, microcontroller and microprocessor as well as the evolutionary history of microcontrollers and will be able to draft project proposal.
2. Know the instructional set of 8051 and be able to conduct short programming.
3. Understand the registers and other addressing modes for assembly language programming and be able to know what is expected in the project document.
4. Know the timers/counters, 16 bit/8 bit reloaded auto reloaded-mode and how to carry out testing in the simulator.
5. Understand various types of interfaces and will be able to draft a project design document.
6. Explain areas of applications of embedded systems and to able to draft a complete term paper from his/her proposed design, which depends on the available resources.

GRADING

1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN405: DIGITAL ELECTRONICS II

OBJECTIVES:

The course shall provide students with:

5. Understanding of basic logic gates
6. Analysis of sequential circuits
7. Design of multi vibrators
8. Design of memory cells
9. Interpretation of manufacturers data sheets

MODULE I: BASIC LOGIC GATES
This module will present the various design principles of logic gates such as DCTL, TTL etc and logic gate ICs. It will also introduce design of combinational logic circuits.
MODULE II: SEQUENTIAL LOGIC GATES
This module will introduce student to various flip flops, counters, shift registers and analysis of sequential logic gates
MODULE III: MULTIVIBRATORS
This module introduces students to monostable and astable multivibrators using CMOS, operational amplifiers and the 555 timer.
MODULE IV: MEMORY CELLS
This module will introduce student memory cells-static RAM cells, dynamic RAM cells, ROM, PROM, EPROM, E2PROM and sense amplifiers.
MODULE V: DATA SHEET TIMING DIAGRAM
Students will be taught how to interpret manufacturer's data sheets.

LABORATORY PRACTICALS
Construction of multivibrator circuits using the 555 timer and other components

Learning Outcomes

By the end of the course students should be able to:
5. Use digital logic gates in designing circuits
6. Design and understand principles of operations of sequential logic circuit
7. Build and test logic circuits involving multivibrators.
8. Design memory cells
9. Use data sheet information to successfully design electronic circuits

GRADING
3. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
4. Semester Examination (60%)

ETEN407: INTRODUCTION TO SEMICONDUCTORS MICROELECTRONICS
OBJECTIVES
1. Student should understand Characteristics, properties and applications of semiconductors
2. Student should understand the basics principles and laws governing quantum mechanics
3. Student should understand the basics of tunneling and tunneling devices.
4. Student should understand applications of tunneling
5. Student should understand Harmonic oscillators

MODULE I: SEMICONDUCTORS
Review of Conductors, Semiconductors and Insulators: Properties, Characteristics and applications.
MODULE II: QUANTUM MECHANICS
This module will expose students to understand the Various Principles and law governing quantum Mechanics.
MODULE III: QUANTUM TUNNELLING
The basics concept of tunneling and tunneling devices.
MODULE IV: APPLICATION OF QUANTUM TUNNELLING
Applications of tunneling, tunneling effect etc
MODULE V: HARMONIC OSCILLATORS
Basic Principles of operations of Harmonic oscillators
Learning Outcomes
By the end of this course student should be able to:
1. Understand Characteristics, properties and applications of semiconductor
2. Understand the basics principles and laws governing quantum mechanics
3. Understand the basics of tunneling and tunneling devices
4. Understand applications of tunneling
5. Understand the Basic principles of operations of Harmonic oscillators

ETEN409: CAD FOR ELECTRONICS DESIGN

AIM:
This course introduces students to the use of computer-aided-design (CAD) tools and hardware description language (HDL) to analyze, synthesize, and verify complex digital systems. In this course, students have to undertake analysis, synthesis, and verification of a complex digital system using HDL using CAD tool.

LEARNING OBJECTIVES
To provide an introduction to the fundamentals of Computer-Aided Design tools for the modelling, design, analysis, test, and verification of digital Very Large Scale Integration (VLSI) systems.

COURSE OUTLINE

MODULE I: Introduction to Computer-Aided Design
Digital logic technologies, ASIC types. Design abstraction levels, modular approach, design flow. CAD systems & tools, synthesis & simulation. HDL, CAD flow for HDL design & FPGA implementation. HDL environment; technology libraries. ASIC, FPGA internals & VLSI methodologies.

MODULE II: Verilog fundamentals
Basic structures in HDL; data types, operators and expressions. Modeling styles - behavioral, dataflow, structural. Concurrent statements, sequential constructs, if-then-else, case, loop.

MODULE III: HDL modeling of combinational digital building blocks
Combinational logic units, multiplexers, decoders, adder, comparator.

MODULE IV: HDL modeling of sequential digital building blocks
Sequential logic: edge-triggered flip-flops, registers. Simple sequential circuits, datapath units. Design of FSMs.

MODULE V: RTL Modeling & Design
Modeling at RT level - bussing strategy, timing and control, RTL control sequence. VHDL design of datapath and controller units. Shift registers, counters. Case study of a simple processing/arithmetic unit.

MODULE VI: RTL Case studies and High-level Synthesis
GCD-calculator, sequential multiplier, Synthesis Issues, algorithmic specifications to RTL, DFG, scheduling & allocation, single assignment form

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

1. Describe basics digital systems for FPGA-based and application-specific integrated circuits (ASIC) based design.
2. Design digital systems in HDL (involves analyses, synthesis, and verification)
3. Demonstrate critical thinking and problem-solving skills to design a complex digital system targeting for an ASIC or FPGA implementation.
4. Articulate and present the design of a complex digital system in the forms of report-writing and short seminar presentation

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

500 LEVEL
FIRST SEMESTER

ETEN501: INTEGRATED CIRCUITS AND SYSTEMS DESIGN

OBJECTIVES:
1. To know integrated circuits (ICs) are and the different types
2. To know the materials used for IC design and the basic design process
3. To understand the process of timing in IC design and operation
4. To know how to evaluate the performance of ICs
5. To know the basic computer program used for IC design and simulation

MODULE I: MATERIAL PROCESSING AND BASIC DESIGN CONCEPT
Introduction to VLSI technology, MOS transistor theory, Inverter circuits, Data and control flow, MOS processing and design rules.

MODULE II: PRINCIPLES OF IC DEVELOPMENT
Integration and system fabrication, Logic design with MOS

MODULE III: TIMING CONCEPT IN IC DESIGN
Architecture and design of system controllers, System timing, Highly concurrent systems and their suitability for VLSI implementation

MODULE IV: CIRCUIT DESIGN AND ELEMENTS EXTRACTION
Signal processing using MOS technology, Standard cell design methodologies with emphasis on layout design, Circuit and parasitic element extraction and verification of circuit performance via simulation tools

MODULE V: SOFTWARE ASPECT OF IC DESIGN
Design of functional blocks of digital ICs using SPICE

LABORATORY PRACTICALS
1. Simple analog and digital circuit implementation experiments with emphasis on the block diagram of the IC used
2. Boolean functions implementation experiments digital MOS ICs
3. Timing circuits experiments using timer ICs (555-Timer)

LEARNING OUTCOMES
At the end of this course the students are expected to:
1. Know what is IC and its types
2. Know the materials used for IC design and the basic design process
3. Understand the process of timing in IC design and operation
4. Know how to evaluate the performance of ICs
5. Know the basic computer program used for IC design and simulation

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN503: TELECOMMUNICATIONS NETWORKS I

OBJECTIVES
1. Describe the key elements of voice and data communications networks.
2. Explain the principle of higher multiplexing hierarchies
3. Explain the principle and applications of circuit- and packet- switching techniques
4. Explain multimedia communications and systems,
5. Introduce key access technologies and their characteristics

MODULE I
Introduction to: - communication networks and services, network hardware, voice and data networks. The rapidly changing world of telecommunications
MODULE II
PCM Systems, Plesiochronous digital hierarchy (PDH), Synchronous digital hierarchy (SDH)

MODULE III
Packet switching, circuit switching, network control and signaling packet network technologies, internet technologies

MODULE IV
Multimedia systems, multimedia communications and processing

MODULE V
Introduction to access network technologies including xDSL, PONS, Fiber Coax. Evolution and potential of ATM, ADSL and PONS, multiservice networks

MODULE IV
Principle of Synchronous Digital Hierarchy, Wave-Division Multiplexing (WDM) Principles and Optical Transmission network (OTN)

LEARNING OUTCOMES
1. A comprehensive knowledge of the underlying technologies of digital communication networks and data transport technologies for use in access and core networks
2. A comprehensive knowledge of the underlying technologies of packet-based networks and the use of this knowledge to analyse the different components and layer functionality of such networks.
3. An understanding of the fundamentals of circuit switching and the multi-stage switching arrangements and the use of such knowledge to design and analyse optimum switches with varying degrees of availability and complexity
4. An understanding of the functional differences between circuit switched and packet switched networks and between connection oriented and connectionless architectures
5. Ability to identify and classify the key metrics required to assess the quality of service (QoS) in IP-based networks and then to optimise network operation.
6. Ability to investigate and define various types of networks appropriate for pre-specified applications and operation scenarios.

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN505: DIGITAL COMMUNICATIONS

OBJECTIVES:
The primary goal of the course is to provide students with an understanding of the fundamentals of digital signalling, information theory and coding, digital transmission, and reception. The goal is to equip the students with the basic knowledge for designing, analysing, comparing, and managing digital communication systems.

MODULE I: INTRODUCTION
This module covers the motivation for the introduction of digital communication systems, comparison between analog and digital communication systems, an overview of a digital communication system and channel characteristics.

MODULE II: COMMUNICATION SIGNALS AND SYSTEMS CHARACTERIZATION
This module covers the mathematical representation of bandpass signals and systems, mathematical representation of bandpass noise, and vector space concepts for signal representation.

MODULE III: DIGITAL MODULATION AND TRANSMISSION SYSTEM MODEL
This module covers digital modulation theory for an additive white Gaussian noise (AWGN) channel, binary modulation, *M*-ary baseband and bandpass modulation/demodulations, and detection methods in AWGN

channel. It also covers bit vs. symbol error probabilities, bit error rate (BER) graph reading and relations to symbol error rate (SER).

MODULE IV: BASIC INFORMATION AND CODING THEOREMS
This module covers introduction to information theory and coding which includes probabilistic information measure and entropy, source coding and source coding theorem, prefix coding and Huffman codes, mutual information and channel capacity concepts, Shannon theorems. It also covers fundamental limits for communication systems, capacity for the bandlimited AWGN channel, and asymptotic behaviour.

MODULE V: ERROR CONTROL CODING
This module covers error correction coding principles (encoding and decoding), block codes and syndrome decoding, hamming and cyclic codes, Reed-Solomon and BCH codes, error detecting and ARQ versus forward error correction. It also covers the elementary concepts of convolutional codes and Viterbi decoding.

LEARNING OUTCOMES
Upon successful completion of the course, students should be able to:

1. Recognize and develop signal space representations for digital modulation methods.
2. Compare the strengths, weaknesses, and requirements of different digital modulation techniques.
3. Compress data to use less channel bandwidth without sacrificing information by using source coding techniques.
4. Protect transmitted data from noise and interference by employing channel coding methods.

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN507: ELECTRONICS ENGINEERING II

OBJECTIVES
1. to understand the concept of switching and pulse circuits
2. student will be able to understand the converters (analog and digital) and the waveform generators
3. The student will be able to know the microwave electronic devices and uses.
4. to understand the voltage comparators and differential amplifier comparator and other comparator applications.

MODULE (I): SWITCHING AND PULSE CIRCUITS
Explain the common pulse waveform and their characteristics including the linear wave-shaping circuits. Detailed explanation on the 555 timer and its applications (MMV, BMV, AMV, RAMP, PWM, stair-case oscillators, etc), which include Multivibrator circuits using op-amps with examples.

MODULE (II): NON-LINEAR ANALOG SYSTEMS:
Comprehensive explanation on comparators, sample and hold circuits. Detailed explanation on precision A/D and D/A converters. Detailed lectures on the logarithmic amplifiers and waveform generators with examples.

MODULE (III): MICROWAVE ELECTRONIC DEVICES:
Definitions of microwave frequencies and its uses with an excessive explanation on high frequency limitations of transistors. Detailed explanation on microwave transistors, Gunn Effect and Gunn diodes, which include IMPATT and TRAPATT diodes with negative resistance amplifiers. Parametric amplifiers will also be explained with examples.

MODULE (IV): VOLTAGE COMPARATORS:
Excessive explanations on the differential amplifier comparator with high gain differential amplifier regenerative comparator. Examples and calculations on differential amplifier as an astable multivibrator, include Schmidt trigger circuits. Some areas of application of comparator circuits.

LEARNING OUTCOMES
Students that successfully complete this course should be able to:

1. Define and understand the concept of switching and pulse using 555 integration circuits.
2. Understand and appreciate the operations of A/D and D/A conversion circuits
3. Know microwave electronic devices and their uses
4. Perform the calculations related to the voltage comparators and differential amplifier comparators.

ETEN509: ENGINEERING MANAGEMENT AND DECISION MAKING

Aim: Introduce the basic engineering management and decision-making skills.

OBJECTIVES:

1. Students shall be able to understand project management techniques as applied to development projects.
2. Students shall understand the concept of productivity in order to increase productivity and also to know the various factors affecting the productivity in the industry.
3. Students will be introduced to the concept of production planning in an intermittent and continuous manufacturing in industries, planning and control in project management and project scheduling
4. Students shall be able to carry out quantitative and qualitative analysis using markov chains model and their theory, inventory theory and management in decision making
5. Understand the role of communication engineer in services design and implementation

MODULE I: PROJECT MANAGEMENT

The concept of project management, project management techniques as applied to development projects, defining a work breakdown structure, use of basic project planning tools. Control of projects to meet targets of cost.

MODULE II: PRODUCTIVITY

Definition of productivity, factors affecting productivity in industry, measurement of productivity. How to increase productivity in the industry.

MODULE III: PRODUCTION PLANNING AND CONTROL

Production control in intermittent manufacturing industry. Production control in continuous manufacturing, Planning and Controlling in project management. Project Scheduling.

MODULE IV: QUANTITATIVE AND QUALITATIVE ANALYSIS

Quantitative and qualitative analysis in decision making. Markov chains model and their theory, inventory theory and management. Simulation

MODULE V: ENGINEERING DESIGN

The role of communication engineer in services and implementation

LEARNING OUTCOMES

Students that successfully complete this course should be able to:

1. Understand the concept project management and techniques as applied to engineering projects
2. Explain productivity and know the factors affecting productivity in an industry
3. Understand project control in intermittent and continuous manufacturing
4. Apply the both quantitative and qualitative analysis in decision making
5. Understand the role of communication engineer in service design and implementation

ETEN513: RELIABILITY AND MAINTAINABILITY

OBJECTIVES:

1. To Introduce the concept of reliability, maintainability and availability.
2. Explain Elementary reliability theory. Applications to electrical and electronics components.
3. To introduce the Test characteristics of electronics and communications engineering components. Designing for higher reliability. Packaging, mounting and ventilation. Protection from humidity, dust etc.

MODULE 1

Introduction to reliability, maintainability and availability.

MODULE 2

Elementary reliability theory. Applications to electronics and communications engineering components. Test characteristics of electronics and communications engineering components.

MODULE 3

Designing for higher reliability. Packaging, mounting and ventilation. Protection from humidity, dust etc.

LEARNING OUTCOMES

1. To understand reliability, maintainability and availability.
2. Understand Elementary reliability theory. Applications to electronics and communications engineering components. Test characteristics of electronics and communications engineering components.
3. To understand how to design for higher reliability. Packaging, mounting and ventilation. Protection from humidity, dust etc.

ETEN517: DIGITAL SIGNAL PROCESSING

OBJECTIVES

1. To understand the concept of signals and systems, and perform basic operations on signals and systems
2. To convert analog signals to digital signals
3. To understand the concept and application of z-transform.
4. To perform discrete time fourier transform,
5. Design digital filters for given performance specifications

MODULE I: GENERAL OVERVIEW

Definition of Digital Signal Processing (DSP), generic block diagram. Comparison with analogue signal processing, Advantages, disadvantages. Applications. Relationship with other scientific and engineering disciplines.

MODULE II: SIGNALS

Definition. Distinguish between analogue and digital signals. Representation of discrete-time signals; graphical, functional, tabular, and sequential. Elementary discrete time signals. Basic operations on sequences; time shifting, time reversal, time scaling, amplitude scaling, signal addition, signal multiplication. Classifications of discrete-time signals; deterministic and random signals, periodic and aperiodic sequences, energy and power signals, even and odd signals

MODULE III: SYSTEMS

Definition. N of discrete-time systems; static and dynamic systems, causal and non-causal systems, linear and non-linear systems, shift variant and shift-invariant systems, stable and unstable systems, FIR and IIR systems, invertible and non-invertible systems. Classifications of discrete-time signals; deterministic and random signals, periodic and aperiodic sequences, energy and power signals, even and odd signals

MODULE IV: DISCRETE CONVOLUTION AND CORRELATION

Definition. Impulse response and convolution sum. Analytical evaluation of convolution. Linear convolution using graphical method. Discrete correlation; cross correlation, autocorrelation

MODULE V: SAMPLING

Introduction. Sampling theorem. Effects of under-sampling. Sampling techniques; ideal sampling or impulse sampling, natural sampling, flat top sampling.

MODULE VI: Z-TRANSFORM

Definition. Region of Convergence (ROC), advantages of z-transform. Z-transform and ROC of finite duration sequences; right-sided sequence, left-sided sequence. Properties of ROC. Properties of Z-transform. Inverse z-transform using long division method. Applications of Z-transform.

MODULE VII: REALISATION OF DISCRETE TIME SYSTEM

Direct Form-I structure of realizing FIR system. Direct form-I structure of realizing IIR system

MODULE (VIII): DISCRETE-TIME FOURIER TRANSFORM (DTFT)

Definition. Existence of DTFT. Relationship between z-transform and Fourier transform. Inverse DTFT. Properties of DTFT. Discrete Fourier transform (DFT). Relationship between DFT and Z-transform

MODULE (IX): DIGITAL FILTERS

Definition. Description of the principle of operation of a digital filter. Design of FIR filter using window method. Finite word length problem. Principle of adaptive digital filter

LEARNING OUTCOMES
Students that successfully complete this course should be able to:

1. define and characterize signals and systems with a view to performing basic operations on the signals and systems.
2. perform signal operations of analog – to – digital conversion
3. perform the different type of Fourier transforms on discrete-time signals.
4. realize discrete time systems in software or/and hardware.
5. design FIR digital filter using window method.

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

500 LEVEL
SECOND SEMESTER

ETEN502: WIRELESS AND MOBILE COMMUNICATIONS

OBJECTIVES:
1. To understand the key technical challenges for wireless communications
2. To understand the cellular concept and how it is implemented as well as its limitations
3. To understand the limiting effects of interference on cellular system capacity and other metrics
4. To understand the propagation mechanisms in the mobile environment
5. To understand the basic structure of cellular network and functions of the main building blocks.
6. To understand the main functions of key telecommunications standard bodies in setting standards and managing radio

MODULE I: WIRELESS COMMUNICATIONS
Introduction: Types of wireless services; wireless local area networks, Ad Hoc Networks, Sensor Networks, personal area networks. Requirements for the services; Data rate, range and number of users; Mobility, energy consumption, use of spectrum. Technical challenges of wireless networks; multipath propagation, spectrum limitations, limited energy, user mobility.

MODULE II: CELLULAR CONCEPT
Introduction, The basic building blocks of cellular concept; frequency re-use, handover/handoff, location management. Choice of cell shape, clustering, system capacity, frequency re-use distance, re-use factor. Cluster size, Traffic flow methods; frequency division duplex (FDD), time division duplex (TDD), how to find nearest co-channel neighbours, channel assignment strategy, hierarchy of cells by size and cellular spectrum

MODULE III: INTERFERENCE
Sources and descriptions of Co-channel interference (CCI), adjacent channel interference (ACI). Determination of Signal to-interference ratio and system capacity. Mitigation techniques against CCI and ACI.

MODULE IV: CELLULAR NETWORK
Generic block diagram of a cellular network. Description of the functions of the main building blocks; base transceiver station (BTS), base station controller (BSC) mobile switching center (MSC), Home location register (HLR), visitor location register (VLR), authentication center (AUC), equipment identity register (EIR) etc.

MODULE V: HANDOVER/HANDOFF
Introduction, Types of handover; hard handover, soft handover. Handover operation/procedure. Performance metrics. Mobile positioning techniques; network based, handset-based.

MODULE VI: HANDOVER/HANDOFF
Introduction, Types of handover; hard handover, soft handover. Handover operation/procedure. Performance metrics. Mobile positioning techniques; network based, handset-based.

MODULE VII: WIRELESS PROPAGATION MECHANISMS
Introduction, Free space propagation model. Reflection; ground reflection (2 ray model). Diffraction; knife-edge diffraction model. Introduction to fading; slow fading and fast fading

MODULE VIII: MULTIPLE ACCESS TECHNIQUES
Introduction, Descriptions of the following multiple access techniques: frequency division multiple access (FDMA), time division multiple access (TDMA), code division multiple access (CDMA). Advantages and disadvantages.

MODULE IX: EVOLUTION OF CELLULAR MOBILE TECHNOLOGIES
1G TO 5G: characteristics, limitations, and applications. Introduction to MIMO, OFDM Telecommunications standard bodies; ITU, 3GPP, ETSI, AINSI, IEEE; Their functions.

LEARNING OUTCOMES
By the end of this course students should have understood:
1. The types of modern wireless services, their requirements limitations
2. The cellular concept and the limitations imposed by interference on system capacity and quality of service
3. The key propagation impairments
4. How handover is affected when a mobile cross the cell boundary.
5. How telecommunications standard bodies operational standards and management thee radio spectrum

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN504: TELECOMMUNICATIONS NETWORKS II

OBJECTIVES:

1. Student will learn the different applications of telecommunication networks and understand the current state of the telecommunications industry.
2. Student will learn the 7-layer OSI network model (each layer and its responsibilities) and understand the TCP/IP suite of protocols and the networked applications supported by it**.**
3. Student will acquire the knowledge of the basic protocols involved in wired and wireless communication process.
4. Students will learn the basic design principles of broadband wired and wireless communication networks (802.11x) in the business environment.
5. Student will learn about the need for network security practices in organizational units.
6. Students will acquire basic knowledge on various concepts of classical computer and network security paradigms.

MODULE I: INTRODUCTION TO TELECOMMUNICATION NETWORKS

This module covers the underlying engineering principles and overview of telephone networks, computer networks, and integrated networks. It also covers the basic concepts and terminology for telecommunications networks, evolution of networks and services - PSTN, ISDN, Internet, and mobile services.

MODULE II: OSI LAYERED NETWORK ARCHITECTURE

This module covers the concept of layered architecture modelling; Open system interconnection (OSI) reference model; Services and service access points; Functions of the OSI Layers; TCP/IP protocol suite; and Client-server communications.

MODULE III: TELETRAFFIC AND TELEPHONE NETWORK

This module covers the purpose of teletraffic theory; Network level switching principles which include circuit switching, packet switching, cell switching; Public Switched Telephone Network (PSTN); Digital Subscriber Line (DSL); Synchronous Optical NETwork (SONET)/Synchronous Digital Hierarchy (SDH); Asynchronous Transfer Mode switching (ATM); Routing which include basics of routing, Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP); Congestion control.

MODULE IV: LOCAL AREA NETWORKS

This module covers local area network technologies including ETHERNET, Token Rings; Multiple-access schemes such as CSMA/CD, CSMA/CA and Token-passing; MAC addressing; Switched vs. shared ETHERNETs; Internetworking devices; Network layer protocols, including IP, ARP and ICMP; IP addressing schemes and subnetting; Internet routing protocols; Transport layer protocols; Ports and sockets; TCP connection establishment; Error, flow and congestion control in TCP; Applications layer protocols such as HTTP, FTP, DNS, SMTP, TELNET.

MODULE V: NETWORK SECURITY

This module covers security considerations in business applied network systems architectures and approaches in facing possible intrusions and intrusion detection; Motivation and introduction to information security; Overview of the discipline of cryptography; Authentication protocols including Kerberos and PKI; Overview of computer and network threats and attacks; Contemporary network defence countermeasures; Planning and implementing security policies.

MODULE V:

5G core network evolution and key technologies, Network operation and maintenance.

LEARNING OUTCOMES

Upon successful completion of the course, students should:

1. Be able to state the requirement for layered approach and explain the basic concept of layering in the network model.
2. Know and understand the traffic engineering principles and the basic measures of traffic and use these to estimate traffic statistical parameters and analyse networks capacity.

3. Be able to analyse the functional differences between circuit switched and packet switched networks and between connection oriented and connectionless architectures.
4. know how routing is carried out in large open networking environment and the operations of major routing protocols such as RIP, OSPF and BGP.
5. Be able to discuss the design principles of wired and wireless communication networks.
6. Be able to explain the fundamentals and technologies of physical, data-link and network layers of the OSI reference model.
7. Have a basic knowledge on the fundamentals of cryptography such as symmetric/asymmetric encryption, digital signatures, and hash functions.
8. Be able to discuss and explain current network authentication applications, PKI, Web security and their vulnerabilities that are exploited by intentional and unintentional attacks.

GRADING

1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN506: OPTICAL FIBRE COMMUNICATIONS

LEARNING OBJECTIVES:

1. To understand the principle of light propagation along a fibre optic cable
2. To identify the important characteristics of light
3. To describe fibre optic cable construction
4. To describe different types of fibre optic cables according to their index profiles and their characters
5. To understand the main losses that occur in a fibre optic cable
6. To perform fibre optic link design using the power budget

MODULE I: OVERVIEW OF FIBER OPTIC COMMUNICATION SYSTEMS

Evolution, nature of light, generic block diagram of fiber optic communications system. Need for fiber optic communication. Advantages and applications

MODULE II: OPTICS REVIEW

Basics of transmission of light rays: properties of light, reflection, refraction, diffusion. Ray theory transmission: Total internal reflection, acceptance angle, numerical aperture, skew rays,

MODULE III: CLASSIFICATION OF OPTICAL FIBRES

Index profiles; step index multimode, graded index multimode, step index monomode. Their characteristics, advantages, disadvantages, applications

MODULE IV: FIBER LOSSES

Attenuation, scattering; linear and non-linear. Absorption; material absorption and extrinsic absorption. Fiber bend losses. Dispersion; intra modal dispersion, intermodal dispersion, Polarisation mode dispersion.

MODULE V: OPTICAL TRANSMITTERS AND RECEIVERS

Light emitting diode (LED): optical output power-current characteristics, output spectrum, lifetime, rise/fall time, modulation response. Semiconductor laser diode, basic principles of laser action in semiconductors, principle of operation of Fabry-Pero resonator.

Principle of optical detection. Important parameters of photodetectors. Avalanche photodiode and PIN photodiode. Their characteristics and applications.

MODULE VI: SYSTEM DESIGN AND PERFORMANCE:

System design: Power budget. Rise time budget. Sources of power penalty. Simplified design procedure.

MODULE VII: CFOT TRAINING:

Overview of fiber optic applications and installations,
Communications systems utilizing fiber optics,
Fiber optic components appropriate for fiber optic networks,
Installation of premises and outside plant fiber optic cable,
Splicing and termination,
Testing fiber optic components and cable plants,
Hands-On Lab Exercises including hands-on splicing, termination and testing.

LEARNING OUTCOMES

1. Understood the principles governing the propagation of light along a fibre optic cable
2. Understood and explain the losses that occur in fibre optic cable.
3. Understood different types of optical fibers in terns of their index profiles
4. Understood the factors that limit the performance of fibre optic transmission systems

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN508: SATELLITE COMMUNICATIONS

OBJECTIVES:
The primary goal of the course is to provide the students an understanding of the fundamentals of satellite communications and the types of satellite communication services. Satellite links, i.e. uplinks and downlinks, are explained and differentiated. The subsystems of satellite communication systems are described. Satellite orbits, orbital laws, orbital perturbations and means of maintaining desired orbital position are also presented in this course. Students are also presented with the concept of satellite link budget and its importance is explained.

MODULE I: INTRODUCTION
Describe, using block diagram, a generic satellite communications system. Introduce the basic satellite communications services: Fixed satellite service (FSS), Mobile satellite service (MSS), Broadcast satellite service (BSS). Satellite frequency bands. Explain why downlink frequency is always lower than the uplink frequency

MODULE II: SATELLITE SUBSYSTEMS
Explain the functions of the main satellite subsystems: Communications subsystem; monitoring and control subsystem; antenna system

MODULE III: ORBITS
Derive equation of the orbit. State and describe Kepler's orbital laws. Explain Hohmaan's principle of orbit launching.

MODULE IV: ORBITAL LAWS
Categorization of satellite orbits according to their altitude above the earth. Explain characteristics of the orbits in terms of round trip delay, viewing period, speed.

MODULE V: ORBITAL PERTURBATIONS
State and describe the main types of orbital perturbations. Explain the principles of satellite attitude control and station keeping

MODULE VI: SATELLITE LINK BUDGET
Explain the concept of link budget. Derive expressions for: uplink budget, downlink budget, overall link budget. Explain the practical significance of each segment.

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Describe the basic components of a satellite communication system, understand the basic services it provides and the frequency bands of operation
2. Describe the functions of the main satellite subsystems.
3. Understand satellite orbital laws
4. Understand THE sources and types of orbital perturbations and how to correct their effect through attitude control and station keeping
5. Understand the concept of link budget and its application in satellite link design

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN510: TELECOMMUNICATIONS SYSTEMS POLICY AND PLANING
OBJECTIVES:
7. Students should understand the various telecommunications standards, monitoring and regulation
8. Students should understand global telecommunications standards collaboration
9. Students should understand spectrum management
10. Students should understand spectrum policy, planning and assignment

MODULE I: TELECOMMUNICATION STANDARDS
This module should introduce students to the various ITU structures and functions, ITU regulations and recommendations, their activities and study groups.

MODULE II: GLOBAL TELECOMMUNICATIONS STANDARDS COLLABORATION
In this module students should be exposed to international and regional telecommunications standards, Nigerian communications act and Nigerian communications commission

MODULE III: SPECTRUM MANAGEMENTS
This module introduces students to various classifications and features of the spectrum, spectrum managements goal and utilization.
MODULE IV: SPECTRUM POLICY, PLANING AND ASSIGNMENT
This module exposes students to various methods of spectrum auctioning, allocation procedures, frequency assignment. It also provides the basics of national, regional and international spectrum management regulatory framework spectrum management application and improvement techniques
Learning Outcomes
By the end of this course students should be able to:

6. Be able to identify the various telecommunication standards
7. Understand global telecommunications collaboration and standards
8. Understand Why there is need for Managements and utilization of spectrum
9. Understand why spectrum is a limited resources and source of revenue to the government

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN 512: DIGITAL SWITCHING SYSTEMS
LEARNING OBJECTIVES
1. To understand the principles of communication switching
2. To understand the functions of digital switching systems
3. To describe different types of switching systems
4. To analyse congestion in a switching matrix
5. To understand the concept and applications of signaling
6. To understand the structure of SS7 signaling protocol and its functional elements

MODULE I: Principles of Communication Switching
Concept of switching and signalling. Functions of a switching system. Electronic switching. Digital switching systems. Classes of switching systems: space division switch, time division switch, frequency division switch
MODULE II: Time Division Switching
Space and Time switching, Time division switching networks Time multiplexed space and time switching, Combination switching and 3 stage combination switching. Call blocking within the switch matrix.
MODULE III: Types of Switching Techniques
Circuit switching, packet switching, message switching, cell switching, frame relay. Switching Techniques for Data Transmission: Circuit switching, Message Switching and Packet Switching Relative Merits and Demerits
MODULE IV: Control of Switching Systems
Call-processing functions. Common control. Stored-program control. Computer controlled switching systems
MODULE V: Packet Switching
Statistical multiplexers. LAN and WAN. Large-scale networks. Broadband network
MODULE IV: Signalling Systems
Concept. Channel associated signalling. Common channel signalling. Comparative analysis. Customer line signalling, PCM signalling, inter-register signalling
MODULE V: SS7 Signalling
SS7 signalling between exchanges SS7 signalling networks. The structure of SS7 signalling: message transfer part (MTP), telephone user part (TUP), integrated service user part (ISUP), signalling connection control part(SCCP) Mobile user part.
LEARNING OUTCOMES
At the end of the course, the students will be able to:
1. Understand and explain the concept of switching and signalling in the telecommunications network environment.
2. Describe the evolution of switching systems.
3. Distinguish between channel-associated and common-channel signalling systems.
4. Explain in-depth, time-division switching and packet switching.
5. Understand different types of switching techniques

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

ETEN514: TELETRAFFIC ENGINEERING

OBJECTIVES:
1. Introduce teletraffic engineering and explain its purpose
2. Describe the different teletraffic models and the characteristics of teletraffic
3. Introduce the different switching modes, teletraffic measures and models
4. Explain network planning and dimensioning to minimize data loss and delay

MODULE I: BASIC CONCEPTS
In this module, students will be introduced to the purpose and foundation theory of teletraffic engineering, teletraffic models, classical model for telephone traffic, classical model for data traffic
MODULE II: TRAFFIC CHARACTERISTICS
In this module, students will learn about traffic intensity, arrival and holding time probability distributions
MODULE III: LOSS AND DELAY SYSTEMS
In this module, students will learn about Erlang B and C formulae and their applications, network delay and blocking probabilities
MODULE IV: SWITCHING MODES
In this module students will learn the principles of the following basic switching modes: circuit switching, packet switching, cell switching.
MODULE V: TRAFFIC MEASUREMENTS AND MODELING
In this module students will learn about traffic measurements and variations, traditional modeling of telephone traffic, novel models for data traffic
MODULE VI: NETWORK PLANNING AND DIMENSIONING
In this module students will learn about the elements of congestion and the basic techniques of controlling it.
LEARNING OUTCOMES
At the end of this course, students should:
1. Understand the basic concepts of teletraffic engineering
2. Be able to measure and analyze teletraffic data
3. Understand the causes of congestion in a network

GRADING
1. Continuous assessment: Assignments, Reports/Presentation, Written test (40%)
2. Semester Examination (60%)

8.0 KEY MODIFICATIONS ON EXISTING CURRICULUM

A. New Courses

1. It was observed that the former curriculum is deficient of number of laboratory practical, hence the introduction of additional 2 credit unit of laboratory practical at 500L (ETEN 511).
2. Also introduction of Teletraffic Engineering (ETEN 514) to cater for current emerging technologies in Electronics and Telecommunications domain as well as intending collaboration with Huawei 5G collaboration.
3. Engineering Management and Decision Making (ETEN 503).

B. **Modification on some of the existing courses.**

The course content of some courses were reviewed and some courses were re-aligned for better students understanding:
1. ETEN 304, ETEN 305, ETEN 316, ETEN 506, ETEN504, ETEN 503 and ETEN 409.

C. Re-aligning some courses

1. Re-aligned ETEN 305 prior to ETEN 316.
2. The Final year project was moved to second semester and made 6 credit unit instead of appearing in first and second semester with 3 credit each.

D. **Change of course code**

1. The course codes of the Department were changed following the approval for the change of name of the Department by NUC from Telecommunications to Electronics and Telecommunications Engineering i.e (from CMEN to ETEN).

9.0 LIST OF STAFF

No	Names	P. NO.	Qualification	Rank	Area Of Specialization	DEPARTMENT	FACULTY	Phone No.	University e-mail	Alternate e-mail
1	Aliyu Danjuma Usman	P22183	PhD, MSc, B.Eng.	Professor	Electronics and Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08066238363	adusman@abu.adu.ng	aliyuusman1@gmail.com
2	Kabir Ahmad Abubilal	P18690	PhD, MSc, B.Eng.	Professor	Electronics Engineering	Electronics and Telecommunications Engineering	Engineering	07034869206	kabirahmad@abu.edu.ng	
3	Abduolie Momodou Sunkary Tekanyi	P19579	PhD, MSc, B.Eng.	Reader	Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08065913532	amtekanyi@abu.edu.ng	
4	Hassan Abdulkarim Abubakar	P18821	PhD, MSc, B.Eng.	Reader	Electronics and Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08034062505		ha2zx@yahoo.com
5	Abdu-Aguye Umar-Faruk	P17364	PhD, MSc, B.Eng.	Reader	Electronics Engineering	Electronics and Telecommunications Engineering	Engineering	08037861058	uabduaguye@abu.edu.ng	uabduaguye@gmail.com
6	Abdullahi Zanna Muhammed	P20400	PhD, MSc, B.Eng.	Senior Lecturer	Electronics and Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08021214488	zabdullah@abu.edu.ng	amzanna@gmail.com
7	Mu'azu Jibrin Musa	P22169	PhD, MSc, B.Eng.	Senior Lecturer	Electronics and Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08067992142	mjmusa@abu.edu.ng	mmjibrin@utm.my
8	Abdulmalik Shehu Yaro	P23667	PhD, MSc, B.Eng.	Senior Lecturer	Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08069254680	asyaro@abu.edu.ng	yaroabdulmalik@yahoo.com
9	Mohammed Dikko Al-Mustapha	P20399	PhD, MSc, B.Eng.	Senior Lecturer	Electronics and Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08032092970	dmalmustapha@abu.edu.ng	md.almustapha@gmail.com
10	Elvis Obi	P22284	PhD, MSc, B.Eng.	Lecture I	Mobile Communications and Signal Processing.	Electronics and Telecommunications Engineering	Engineering	08060838719	eobi@abu.edu.ng	Elvisobi72@gmail.com
11	Ochia Okechukwu Emmanuel	P22283	PhD, MSc, B.Eng.	Lecture I	Electronics and Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	07032849982	oeochia@abu.edu.ng	
12	Surajo Muhammad	P23867	M.Eng, B.Eng.	Lecture I	Electronics and Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	07039698189	p23867@abu.edu.ng	
13	Kabir Mahmoud Tukur	P22895	PhD, MSc, B.Eng.	Lecture I	Electronics and Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08136449743	mtkabir@abu.edu.ng	

14	Habeeb Bello	P25650	PhD, MSc, B.Eng.	Lecturer I	Electronics Engineering	Electronics and Telecommunications Engineering	Engineering	07036667227	Bello.habeeb@abu.edu.ng	bellohabeebu@yahoo.com
15	Fahad Abdu Jibrin	P23739	MSc, B.Eng.	Lecture I	Telecommunications and Software Engineering.	Electronics and Telecommunications Engineering	Engineering	08060288816	p23739@abu.edu.ng	
16	Ismail K. Musa	P22162	M.Phil., B. Eng.	Lecture I	Electronics and Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08094484876	p226162@abu.edu.ng	Ismikmsa7@gmail.com
17	Mikail Shamsudeen Abdullahi	P23923	MSc, B.Eng.	Lecture I	Satellite and Mobile Communications	Electronics and Telecommunications Engineering	Engineering	07031347551	samikail@abu.edu.ng	
18	Isiyaku Yau	P23917	MSc, B.Eng.	Lecture I	Optical Communications Engineering	Electronics and Telecommunications Engineering	Engineering	07068153701	isiyakuyau@abu.edu.ng	ishaaqyau@gmail.com
19	Aminu Muhammad Abba	P24569	MSc, B.Eng.	Lecture I	Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	07063162524	amabba@abu.edu.ng	
20	Ezekiel Ehime Agbon	P24571	MSc, B.Eng.	Lecture I	Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	07061636968	p24571@abu.edu.ng	
21	Abduljalal Yusha'u Kassim	P24570	MSc, B.Eng.	Lecture II	Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08167688890	aykassim@abu.edu.ng	aykassim2019@gmail.com
22	Muhammad Ziyaulhaq Zakariyya	P24623	MSc, B.Eng.	Lecture II	Telecommunications Engineering	Electronics and Telecommunications Engineering	Engineering	08038382215	zzmuhammad@abu.edu.ng	Zzmuhammad38@gmail.co,m

LIST TECHNICAL STAFF

S/N	Name	P. NO.	Qualifications	Rank	Highest academic qualification	Laboratory Attached	DEPARTMENT	FACULTY	Phone No.	University e-mail	Alternate e-mail
1.	Ogbole mathew adeka	P17497	B.Eng.	Asst .Chief Technologist	B.Eng.	Telecommunications Lab.	Electronics and Telecommunications Engineering	Engineering	08053337526		
2.	Mustapha Suleiman	P19525	MSc	Principal Tech. Officer I	MSc	Etisalat Lab.	Electronics and Telecommunications Engineering	Engineering	08032638314		
3.	Samaila Bako Parah	P18397	HND	Principal Tech.	HND	Electronics Lab	Electronics and Telecommunications	Engineering	08072307873		

				Officer II			Engineering				
4.	Abdulkarim Buhari	P19440	HND	Principal Tech. Officer II	HND	Telecommunications Lab.	Electronics and Telecommunications Engineering	Engineering	08034584838		
5	Jerome Olorunpomi	P18395	HND	Principal Tech. Officer II	HND	Electronics Lab	Electronics and Telecommunications Engineering	Engineering	08036438657		
6.	Musa Abdullahi Hudu	P22335	HND	Principal Tech. Officer II	HND	Etisalat Lab.	Electronics and Telecommunications Engineering	Engineering	07036213577		
7.	Aminu Abubakar Sadiq	P22353	HND	Principal Tech. Officer II	HND	Electronics Lab	Electronics and Telecommunications Engineering	Engineering	08092962231		
8.	Aminu Yusuf Musa	P25421	HND	Higher Technical Officer	HND	Telecommunications Lab.	Electronics and Telecommunications Engineering	Engineering	07030472732		
9.	Jafar Abdulwahab	P29422	OND	Technical Officer	OND	Electronics Lab	Electronics and Telecommunications Engineering	Engineering	07039144175		
10.	Hassan Salihu	P25650	OND	Technical Officer	OND	Etisalat Lab.	Electronics and Telecommunications Engineering	Engineering	08035984250		

ADMINISTRATIVE STAFF

S/N	NAME	P. NO.	Qualification	Rank	Area of Specialization	Department	Faculty	Phone No.	University e-mail	Alternate e-mail
1	Fidelia Akwari	P21209	NCE	Senior Confidential Secretary	Secretarial Studies	Electronics and Telecommunications Engineering	Engineering	08036377501		
2	Abdullahi Suleiman	JP18922	SSCE	Senior Driver		Electronics and Telecommunications Engineering	Engineering	08069678282		

10.0 LIST OF FACILITIES

The Department has 3 existing undergraduate classes, 4 laboratories, one workshop and 20 staff offices. The Department also have 5 smart boards and well equipped laboratories.

11. ANY OTHER RELEVANT INFORMATION

Electronics and Telecommunications sector is quite emerging as such for academics, there is need for us to regularly update our curriculum so as to prepare our students to meet up with the challenges.