ACHIEVERS UNIVERSITY OWO, ONDO STATE, NIGERIA

ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME

UNDERGRADUATE STUDENTS' HANDBOOK

2022/2023 – 2026/2027

Department of Electrical and Information Engineering, Achievers University Owo, Ondo State, Nigeria, 2022

Published by:

Department of Electrical and Information Engineering

Achievers University Owo, Ondo State, Nigeria

1. NATIONAL ANTHEM

Arise, O compatriots,
Nigeria's call obey
To serve our fatherland
With love and strength and faith
The labor of our heroes past
Shall never be in vain
To serve with heart and might
One nation bound in freedom, Peace and unity.

Oh God of creation,
Direct our noble cause
Guide our leaders right
Help our youths the truth to know
In love and honesty to grow
And living just and true
Great lofty heights attain
To build a nation where peace and justice shall reign.

2. NATIONAL PLEDGE

I pledge to Nigeria my country
To be faithful, loyal and honest
To serve Nigeria with all my strength
To defend her unity and uphold her honor and glory So help me God.

UNIVERSITY ANTHEM

1. Achievers University
   God's glorious habitation

   Our fountain of wisdom

   Our household of love

   Chorus

   We hail thee (2ce)

   Fountain of knowledge

   Wellspring of integrity

   Height of leadership

2. We are the purposeful leaders
   Hope of future generations

   Pillars of great Nigeria

   Achievers - we are

   Chorus

   We hail thee (2ce)

   Fountain of knowledge

   Wellspring of integrity

   Height of leadership

3. VISION OF THE UNIVERSITY

The vision of the University is to be the best University in Africa and indeed one of the best in the world.

4. MISSION OF THE UNIVERSITY

The mission of the University is to provide the enabling environment – Physical and academic – for the production of competent and quality graduates who would be self-reliant, highly productive and globally relevant in every sphere of human endeavor.

PRINCIPAL OFFICERS OF THE UNIVERSITY

Vice-Chancellor

Prof. O.O. Irinoye

B.Sc (Hons), M.Sc, Ph.D

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Registrar

Rev. Canon Samuel Bayode Oladimeji

M.Sc., MBA., B.Sc. (Hons), HND, Dip.Th. MIMC

Bursar

Mrs O.R. Ayodeji

B.Sc, M.Sc., ACA, AMNIM

University Librarian

Mrs. Darlina C. Ogbuiyi-Oriogu

(CLN), M.LIS, B.IRM

FOREWORD

5. **FOREWORD**

The Departmental Handbook provides information to registered students on programme of studies offered by the Department of Electrical and Electronics Engineering, Achievers University Owo, Ondo State, Nigeria. It is hoped that the information would assist students to derive maximum advantages from the opportunities and facilities available in the Department and the University in planning their academic programmes.

The currently available five-year engineering degree programme is built on a common foundation of basic studies comprising Mathematics, Basic Sciences, Engineering Sciences and General Studies. The vision of the Programme is carved from the University vision, which aim is to be the best University in Africa and indeed one of the best in the world. In achieving this mandate, the programme based its emphasis on robust curriculum which is responsive to the dynamic nature of the programme, the aspirations of the product recipients in line with national growth, and self-reliance which is built in professional empowerment giving opportunity for entrepreneurship, industrial attachment, student work experience programme, and international collaboration.

The Department of Electrical and Electronics Engineering Handbook contains information about the programmes in the department. Such information includes: brief about the University and College of Engineering and Technology, general admission requirements, Procedure for students' registration and matriculation, general regulations governing first degree programmes in Achievers University, regulations governing the conduct of University Examinations, and detail information on course outline and contents semester by semester in line with the approved relevant courses in Nigerian University Commission (NUC) BMAS for five (5) years academic sessions leading to the award of Bachelor of Engineering (B.Eng.) Engineering and in Electrical and Electronics Engineering.

This handbook is issued as a general guide to courses and facilities available in the University to run the programmes and forms no part of a contract. The Department reserves the right to modify or alter without prior notice, any of the contents herein. The information contained in this handbook is accurate and up to-date at the time of publication. However, the matters covered are subject to change from time to time. The Department will publish such changes, if there are any, in the next edition of the handbook.

Engr. Prof. Sesan Peter Ayodeji

Dean COET

2022/2023 Academic Session

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SECTION A

GENERAL INFORMATION

1. INTRODUCTION

Achievers University Owo, Ondo State, Nigeria was approved by the National Universities Commission (NUC) on 15th November, 2007. Having received approval from the NUC for the Bachelor of Engineering (B. Eng.) programmes in the College of Engineering and Technology (COET), Achievers University Owo, the Electrical and Electronics Engineering programme took off with B. Eng., Electrical and Electronics Engineering in 2019/2020 Academic session.

The primary aim of starting this programme is to develop manpower for teaching as well as provide competent Engineers for Universities, Research Institutes and relevant industries in Electrical and Electronics Engineering.

The programme is designed to provide in-depth knowledge in all areas of Electrical and Electronics Engineering and at the end of the programme, the students would have covered all (general and specialized) aspects of Electrical and Electronics Engineering. In addition, the students will be expected to carry out research projects. Apart from preparing the students for an academic career, there will also be opportunity to join the Industries, research Institutes and other Agencies.

1.1. Philosophy

The philosophy of the department is to train Electrical and Electronics Engineers that can apply scientific principles to real life situations in order to sustain the human society and improve its standard of living. The programmes are fashioned to be broad based and encompasses major aspects of Electrical and Electronics Engineering such as Power Systems, Electronics and Communication Engineering, and Control and Instrumentation. In these programmes, theory is integrated with practical to produce engineers with a broad-based knowledge and skills for 21st century Electrical and Electronics engineering. At the end of the programmes, the graduate engineer would be suitable for employment in both public and private sectors such as federal and state ministries, manufacturing companies and telecommunication industries. The graduate of Electrical and Electronics engineer can also be self-employed.

1.2. Aim & Objectives

The aim of this programme is to train and produce Electrical and Electronics engineers who will be asset to the nation and the world at large, and the objectives are to:

i. train and produce students with a broad and balanced scientific and practical foundation to be able to function as professional Engineers;
ii. train and produce men and women who will be alert to the engineering needs of their environment and be willing and eager to solve them by applying engineering principles;
iii. train and produce men and women who are equipped with all necessary tools to facilitate the production of electrical, electronics and telecommunication appliances and components for the benefit of mankind in general;
iv. produce graduates that have acquired the ability to investigate, analyse and provide solutions to problems arising from engineering processes;
v. produce graduates that are self-reliant and can apply logical and rational reasoning in all situations, as well as systematic and analytic approach in solving problems;
vi. produce students with a knowledge and skills base from which they can proceed to further studies in specialized areas involving sciences and ever-changing technological innovation; and
vii. empower graduates of Electrical and Electronics Engineering with skills that will enable them engage in income yielding ventures as well as increasing their entrepreneurial capacity.

2. ADMISSION REQUIREMENTS

Admission into the programme is either through Unified Tertiary Matriculation Examination (UTME) or direct entry.

A. UTME Candidates

Candidates are required to have sat for the Unified Tertiary Matriculation Examination (UTME) with a minimum score as approved by NUC and JAMB. They must also obtain a minimum of five (5) credit passes at not more than two sittings in WAEC (SSCE)/NECO (SSCE) /GCE O/L, OR NABTEB. These should include English Language; Mathematics; Physics; Chemistry and any other acceptable science subject; preferably Biology, Further Mathematics; OR Technical Drawing. **UTME Subjects:** Physics, Chemistry, Mathematics and English Language

B. Direct Entry Candidates 200 Level

As for (A) above. But with 2 passes including Mathematics, Physics or Chemistry at either A Level, JUPEB Exam, IJMB, National Diploma minimum of Upper Credit level in relevant discipline.

C. Direct Entry Candidates to 300 Level

As in (A) above plus

i. Higher National Diploma (HND) minimum of Upper Credit level in relevant discipline.

ii. or any other qualification regarded as acceptable equivalent in relevant field, to be admitted at the appropriate level.

D. Admission by Transfer from Recognized Universities (Local or International)

i. Students may be admitted to appropriate level provided condition in the above is satisfied.
ii. Transcript of previous academic performance is satisfactory
iii. Satisfactory and acceptable report of good conduct is provided.
iv. Each case shall be treated on its own merit

E. Others

Candidates who fail to satisfy criterion stated above may be admitted to the Joint Universities Preliminary Examination Board (JUPEB) during which he will remedy the deficiency and be considered for Direct Entry as in B above.

3. PROGRAMME DURATION

The minimum duration of ach of the programmes is ten (10) semesters for students admitted to 100 level through the UTME and eight (8) and six (6) semesters for those admitted into 200 and 300 level respectively by Direct Entry. A student that fails to graduate at the end of normal academic session will not be allowed to exceed a total of 15 semesters in the case of UTME entrants and 13 and 11 semesters in the case of candidates admitted through Direct Entry to 200 and 300 level respectively.

4. GRADUATION REQUIREMENTS

To be eligible for the award of B.Eng. degree in Computer Engineering and Electrical and Electronics Engineering, a student must have:

(a) passed all core, University/College required, audited and elective courses

(b) accumulated a minimum of 215 units for those admitted through UTME and a minimum of 179, and 127 units for those admitted through direct entry to 200 and 300 levels and obtain a CGPA of not less than 1.5

(c) completed all industrial attachments and visits, practicals and seminars

5. GENERAL ACADEMIC REGULATION FOR DEGREE COURSES

5.1 Unit Course System

The unit course system is understood to mean a quantitative system of organisation of the curriculum in which subject areas are broken down into unit courses which are examinable and for which students earn credit(s) if passed'. The courses are arranged in progressive order in levels of academic progress, for example, 100 level courses are 101, 102 etc., and 200 level courses are 201, 202, etc. The second aspect of the system is that courses are assigned weights referred to as credit units.

(a) The unit of a course shall be by the semester, one semester unit being when a class meets one hour every week for one semester or three/four hours every week in the laboratory for one semester or the equivalent in workshop or fields work time. The size of course shall, as much as possible be a maximum of three units and its duration shall be one semester except for projects and design courses which may carry more than three units and may last more than one semester.

(b) A core course is one which must be registered for and passed by a student to get the degree and is counted towards the classification of his/her degree.

(c) An elective course is either compulsory or optional. A compulsory elective shall be counted towards the classification of a student's degree. An optional elective is a course that may be taken by the student and may not be counted towards the classification of his/her degree.

(d) A University required course is a compulsory course prescribed by the University, which must be passed before a student can graduate. It would also count towards the classification of the degree.

(e) Pre-requisite course is one in which the student must pass before proceeding to the higher course.

(f) Co-prerequisite course is one, which may be taken in parallel with the course for which it is specified.

5.2 Students Work Load

The maximum number of units a student can register for is 24 per semester. The minimum number of units a student can register for is 15 per semester.

5.3 Grading System

Table 1 shows the grading system.

Table 1: Grading System

Mark	Letter Grade	Grade Points
70 – 100	A	5
60 – 69	B	4
50 – 59	C	3
45 – 49	D	2
0 – 44	F	0

5.4. Course Evaluation

The course grade will be made up of the student's score in the continuous assessment as well as the end of course examination. The weights attached to continuous assessment and end of semester examination are 30–40% and 60–70% respectively. External Examiner(s) are appointed only in the final year of the undergraduate programme to assess final year courses and projects, and to certify the overall performance of the graduating students as well as the quality of facilities and teaching.

(a) Continuous Assessment

Assessment of student's achievement shall be continuous. The student shall be periodically informed of his/her standing in the course. Continuous assessment shall be by a combination of the following methods such as un-announced quizzes; class tests; home-work assignments; or mid-semester tests. At least two continuous assessments shall be given on each course in a semester.

(b) Final Examination

Final written examination for a course shall not normally exceed three (3) hours duration and shall be given only at the time and places established for that purpose by Senate or its designated committee. The final examination for each course shall normally be at the end of the semester in which the course is offered.

5.5. Examination Malpractice

A student involved in the University examination malpractice or violates examination regulations, shall be referred to the disciplinary committee which will recommend appropriate disciplinary action.

5.6 Appeal for Re-Assessment

A student may request, under exceptional circumstances and for good cause, for a review and a re-assessment of the quality of his work in a course during the semester following the publication of the result.

Procedure for seeking a revision of marked scripts at the end of semester:

1. Applications for revision of marked scripts shall be made by any aggrieved student, irrespective of the grade obtained in the course, on the payment of a prescribed fee.
2. All applications for revision of marked scripts shall be addressed and forwarded to the Registrar through the Dean.
3. The receipt of prescribed fee for each course shall accompany the application;
4. The Registrar shall forward the request to the appropriate Dean.
5. The Dean shall appoint a minimum of three independent assessors (internal or external) in consultation with the Head of Department, if need be.
6. The Dean shall ensure that the marking scheme and model answers originally used are made available to the assessors;
7. The Dean shall present his report before the Board of Studies and thereafter to Senate for consideration and approval.
8. (a) Where the student's case is upheld, the application fee shall be refunded;
   (b) Where the case is not upheld, the student shall forfeit the fee and shall be warned for making frivolous allegations;
9. Where Senate is convinced that the marking-down of a candidate by the lecturer is deliberate, such staff shall be reprimanded.

5.7. Absence from Examination

A student who is absent from a course examination without the permission of the Head of Department during or at the end of the semester will receive a grade of 'F'. Permission may be granted only on substantiated, compassionate or medical grounds as approved by the Senate.

5.8. Computation of Results

The following terminologies and abbreviations are commonly used in the computation of Grade Point Average (GPA):

(a) **Total Load Units (TLU):** This is the total number of course units carried by a student in a particular semester. It is the summation of the load units on all courses carried during the

semester. For example, a student who is taking 6 courses of 3 units each has a TLU of 18 for that semester.

(b) **Cumulative Load Units (CLU):** - This is the summation of Total Load Units over all the semesters from the beginning to date. A student who is prone to repeating courses will finish (if he does not drop out) with a higher CLU than his non-repeating colleagues, and will most likely require a longer time to complete the requirements for the award of degree.

(c) **Total Credit Points (TCP):-** This is the sum of the products of course units and rating in each course, for the entire semester, or period. For example, consider a student who took 4 courses of 3 units each. Suppose the grades he obtained in the four courses were A, B, C, and D respectively. The TCP of this student is obtained as: -

(3x 5.0) + (3 x 4.0) + (3 x 3.0) + (3 x 2.0) = 15.0 + 12.0 + 9.0 + 6.0 = 42.0.

(d) **Cumulative Credit Point (CCP):-** This is the summation of Total Credit Points over all the semesters from the beginning to date.

(e) **Grade Point Average (GPA):-** This is the Total Credit Points (TCP) divided by the Total Load Units (TLU). For example, consider the student's scores referred to in (c) above. His TCP is 42.0 and his TLU is 12. His GPA is therefore 42/12 = 3.50.

(f) The highest possible GPA that can be earned is 5.0 and that is when a student has earned a grade of "A" in every course during the semester. The lowest GPA obtainable is 0.0.

(g) **Cumulative Grade Point Average (CGPA):** This is not the summation of GPA's for the semester. Rather, it is the summation of TCP for all semesters to date divided by the summation of TLU for the said semesters. Performance in any semester is reported in grade point average. This is the average of weighted grade points earned in the courses taken during the semester. The grade point average is obtained by multiplying the grade point average in each course by the number of credit units assigned to that course, and then summing these up and dividing by the total number of credit units taken for the semester.

This is the up-to-date mean of the grade points earned by the students in a programme of study. It is an indication of the student's overall performance at any point in the training programme. To compute the cumulative grade point average, the total of grade points multiplied by the respective credit units for all the semesters are added and then divided by the total number of credit units for all courses registered by the student.

5.5 Final Assessment and Class of Degree

The final assessment and class of degree is as shown in Table 2.

Table 2: Final Assessment and Class of Degree

Class	CGPA
First Class	4.50 - 5.00
2nd Class Upper Division	3.50 - 4.49
2nd Class Lower Division	2.40 - 3.49
3rd Class	1.50 - 2.39

For the purpose of determining the class of degree, the CGPA shall cover 100 to 500-level courses.

5.6 Probation and Withdrawal from the University

Probation is a status granted to a student whose academic performance falls below an acceptable standard. A student whose cumulative grade point average falls below 1.50 at the end of first session shall be placed on probation during the following session. If he/she then fails to achieve a CGPA of at least 1.50 at the end of that session, he shall be required to withdraw from the University. However, in order to minimize waste of human resources, consideration MAY be given to withdrawal from programme of study and possible transfer to other programmes within the University.

A student will not be placed on probation until the end of the second semester of the first session; thereafter, it shall be from semester to semester. A student on probation shall be advised not to carry more than the minimum load of 15 units for the semester for which he/she is on probation. A student who is unable to get out of probation at the end of the first semester shall be on extended probation till the end of the session, but a student who is out of probation at the end of the first semester shall be allowed to carry a maximum load unit during the following semester.

5.7 Carry over Courses

All failed courses shall be carried over to the corresponding semester of the following year and must be taken and passed before taking higher courses for which such are pre-requisites.

5.8 Vice Chancellor and Dean's List

A student who obtains a GPA of 4.50 and above at the end of any semester will have his name published on Vice Chancellor's list while a student who obtains a GPA between 4.0 and 4.49 at the end of any semester will have his name published on Dean's list. Each list is valid for only the one session immediately following the publication of the results and until the publication of the results of the following semester.

5.9 Duration of Semester

Each semester normally consists of 15 weeks or as determined by Senate (exclusive of the public holidays and mid-semester breaks), which shall be reserved for teaching and a further two weeks for examination.

5.10 Student Registration

5.10.1 Registration of Fresh Students

Registration is the process by which one officially becomes a student in the University; such a candidate must complete the due process of registration leading to matriculation. The process of registration starts with screening of candidates who met the NUC and the University requirements and subsequently issuance of letter of admission.

The complete registration process entails the following:

i. Screening of Provisional student's credentials and verification of admission by the candidate's College/Faculty;
ii. Payment of the prescribed fees by the provisional student (if cleared by the Admissions Officer);
iii. Collection of registration forms and student files from the Academic Office of the Registry after clearance from the bursary;
iv. Completion of course registration forms after due consultation with appropriate departmental and College Course Coordinators;
v. Submission of completed course registration forms duly signed by the course/programme coordinators, Heads of Department, Deans and other officers to the Academic Office;
vi. Submission of completed student files after compliance with the instructions in the files to the Academic Office who would send a copy of the file each to Dean, Department and Student Affairs Offices;
vii. Registration (including documentation, medical examination) at the University Health Centre;
viii. Registration at the University Library.

5.10.2 Course Registration for all Students

Registration for a course at the beginning of a semester automatically means registration for the course and the examination. No separate registration for examination shall be carried out. A student who wishes to add or delete a course must do so within four weeks of commencement of lectures in the course by completing the prescribed form obtainable from the registry. Course registration procedure are:

i Registration for a course shall normally be within the first week of resumption in a semester.

ii Late registration shall only be allowed after payment of the late registration fee and shall come up within the week following the normal registration period.

iii Any student who fails to register up to the end of the late registration period shall be deemed to have unilaterally withdrawn from the university for that semester.

iv Registration for a course shall automatically mean registration for the course and its examination. No formal registration for examination shall be carried out.

v A student may drop a course or add a new one provided he completes the prescribed form and does so within four (4) weeks of the commencement of lectures in the course and obtains the approval of his Head of Department.

vi The maximum Total Load Unit (TLU) to be carried by a student is 24 units per semester and the minimum is 15. If it is established that a student illegally registered for more than the maximum number of units, the best course that makes excess units shall be canceled.

vii Where a student has lower level course(s) outstanding such a lower level course(s) should be registered for at the next available opportunity before registering for the higher level course equivalent to the number of outstanding lower level courses.

viii Every student shall register in person and cases of impersonation will be severely punished. Submission of course registration forms on behalf of any other student shall be treated as impersonation and shall be severely punished.

ix Completed course registration forms duly signed by the Head of Department and the College Dean should be forwarded to the Registrar not later than four (4) weeks from the beginning of the semester.

x The list of students registered for each course shall be forwarded to the Teaching Department and the Registry not later than four (4) weeks from the beginning of the semester.

5.11 Matriculation

Matriculation is a formal admission process and only those who have completed the registration formalities are eligible. All such properly registered fresh students are formally admitted into the University at a matriculation ceremony conducted on a date specified by the Senate.

i. A candidate becomes a bona fide student only after subscribing to the matriculation oath, signing the matriculation register, and being assigned a matriculation number.

ii. The importance of matriculation is underlined by the fact that no official communication or transaction of the student is complete or valid unless it carries the correct matriculation number. This includes examination scripts and student's identity card and other official document pertaining to the student.

iii. Once a student is assigned a matriculation number, it cannot be changed even if the student changes College or programme of study. By convention, student cannot matriculate more than once in the same University.

iv. Matriculating candidate are required to be formally dressed, robed in the University's academic gown.

v. The matriculation ceremony normally marks the end of admission and registration for fresh students.

5.12 Other General Academic Regulations

i. The curriculum of each programme is delivered in courses which are quantified into units. One credit unit shall be 15 hours of lecture per semester delivered at a rate of 1 hour per week; or 30 hours of seminar per semester at a rate of 2 hours per week; or 45 hours of laboratory practical/field work per semester at a rate of 3 hours per week.

ii. An academic session consists of two semesters each of 15weeks of instructions, interspersed by a long vacation.

iii. Undergraduate courses shall be numbered as

100 Level	101 – 199
200 Level	201 – 299
300 Level	301 – 399
400 Level	401 – 499
500 Level	501 – 599

iv. Students admitted through the UTME run the 100 Level courses while those admitted by Direct Entry run the 200 Level courses with the General Studies 100 Level courses as applicable. Transfer students are appropriately guided by his Staff/Level/Course Adviser and the Head of Department.

v. Courses are assigned credit weights of 1, 2, 3, 4, 5 or 6 units. Final year students' project is assigned weight of 5 or 6 units and run throughout the session i.e. in both semesters, while all other courses at all levels shall run within one semester only. For ease of registration, Projects shall be broken into two for both semesters.

vi. First semester course codes are odd numbered while second semester courses are even numbered.

vii. Appropriate pre-requisite and/or concurrent requirements may be prescribed for courses.

viii. A student shall take courses prescribed for his degree programme as approved by Senate on the recommendation of the College Board.

ix. Every student shall *normally* register for not less than 15 and not more than 24 credit units per semester.

x. Students with carryover courses must register first the outstanding courses before that of the current session. Such students, under guidance, can exceed the maximum credit units of 24 with extra 3 or 4 units with the permission of Senate through application to carry extra units.

xi. Students that have outstanding courses/units at the end of their final year courses shall, in any subsequent semester(s) during which they are enrolled in the university, register for not less than a minimum of 5 credit units per semester including those allotted to any compulsory or university courses they may have failed.

5.13. Status of a course:

A course shall be classified as either Core/Compulsory, Required, Elective, Optional or University in a given degree programme of the University.

Core/Compulsory – Courses that must be offered and passed in order to graduate in a given degree programme to which it is specific. When borrowed by another programme, it may not have the same status.

i. **Required Course** – a course that must be registered for and passed, on the advice of the department before graduation.

ii. **Elective** – a course that students take within and outside the College. Students may graduate without passing the course provided the minimum credit unit for the programme had been attained.

iii. **Optional course** – is one taken at the instance of a student either out of interest or to make up the required amount of unit/workload per semester.

iv. **Pre-requisite course** – a course that student must take and pass before taking a particular course at higher level.

v. **University course** – so designed to achieve a definite purpose in the development of the student, it must be offered by all students of the university regardless of the programme and

must be passed without which the student will not graduate, though it will not count in the determination of the final CGPA.

5.14. Student Transfer:

i. The university shall normally entertain cases of students wishing to transfer from or to the Achievers University, Owo as a normal expression of choice.

ii. Student seeking transfer to another university should apply in writing to the Registrar, requesting his transcript to be sent to his chosen university at his own expense.

iii. His College/Department shall be informed by the Registrar who shall have ascertained that the student concerned has fulfilled and discharged all his responsibilities to the university as a pre-condition for the issuance of his official transcript.

iv. Any student admitted by transfer shall have his offer of admission communicated to his former university by the Registrar.

v. Application for admission by transfer to this university should normally be submitted to the Registry on or before 30th June of the year.

vi. Application for transfer shall under any condition, not be entertained beyond 300 level of any programme, that is, no student is permitted to spend less than two (2) academic years to earn a degree of this university.

vii. In considering any transfer case, the candidate must satisfy all prescribed conditions and procedure for admission at the appropriate level in this university.

viii. After proper auditioning, no transfer student shall be credited with more than 30 (100 Level) and /or 30 (200 Level) units of courses earned and transferred from his former university and these must be allotted appropriately to corresponding courses in his programme in the university.

ix. Transferred credits will not be employed in computing the transfer student's overall CGPA.

x. Computation of Good Academic standing and the Final Degree result of a transfer student shall be based on the courses taken in this university.

5.15. Admission to and withdrawal from Courses

i. Registration of courses must be done during stipulated period of the semester. There is a penalty for late registration of courses.

ii. Adding and Dropping of Courses: A student may add or drop registered course(s) by obtaining and completing the Add and Drop Form before the end of the stipulated period

for the exercise. Any student who withdraws from a course without formal permission shall be deemed to have failed it.

iii. All Registration and Add and Drop Forms must be duly signed by the Head of Department, the Dean and the College Secretary.

5.16. Change of Programme of Study

Students are normally not permitted to change from the programme for which admission was obtained in the first instance. However, in special cases, students may be permitted or be advised to change by the College Board and be approved by Senate. Each case must be treated on its own merit.

5.17. Continuous Evaluation

Continuous Assessment shall constitute 30% of the course evaluation. Continuous Assessment must be conducted during the semester and not after the semester examination.

5.18. Examination

i. Every course shall normally be examined during the semester in which it is offered.

ii. Duration of the examination shall be 1-3 hours depending on the credit unit weight of each course but in any case, not more than 1 hour of examination per unit.

iii. A pass letter grade in any course shall be A, B, C, D, while F is a fail grade. Grade point are awarded points as A = 5, B = 4, C = 3, D = 2, and F = 0.

iv. A student can repeat only failed courses; courses once passed cannot be repeated. When a course is repeated, Grade Points earned in all attempts shall count towards the Cumulative Grade Point Average (CGPA).

v. All examinations must be graded and grades submitted through the Head of Department to the Dean not later than the end of second week after the examination. Results from the Colleges must reach the Academic Office not later than the end of the fourth week after the examination.

vi. Final Year Results requiring External Examination shall be released only after they have been approved by the External Examiner and the Senate.

5.19. Scoring and Scoring Grades

i. Student's performance shall be assigned one of the grades A,B,C,D and F, and percentage scores shall be assigned to grades as follows:

Percentage Score	Letter Grade	Grade Point
70 – 100	A	5
60 – 69	B	4
50 – 59	C	3
45 – 49	D	2
0 – 44	F	0

ii. Every Examiner (course lecturer) shall report student's performances in both percentage score and letter grades at the end of each semester.

iii. A student's semester performance shall be reported as Grade Point Average (GPA) and which shall be computed by multiplying the Grade Point obtained in each course by the course's units, summing these up for all courses offered in the semester by the student and then dividing the sum by total units registered for.

5.20. Examiners

i. The Head of Department / Unit is the Chief Examiner of all the courses offered in any examination in his Department and shall have overall responsibility for the conduct and administration of examinations in his Department.

ii. Lecturer(s) that teach(es) a course constitute(s) the internal Examiner(s) of the course and shall be responsible for drafting the questions, preparing the marking scheme and grading the examination scripts of the course as well as conducting the Continuous Assessment of the course during course delivery in the semester.

iii. Final year courses shall be subjected to External Examination by an external assessor who must not be lower in academic rank than a Senior Lecturer, and who must be appointed by the Vice-Chancellor on the recommendation of the Head of Department/Dean, and approved by the University Senate.

iv. The External Examiner shall moderate the Draft Questions, the marked scripts and the overall result of the final year, and write a full report on the same to the Vice-Chancellor, copied to the Dean and Head of Department concerned.

5.21. Good Academic Standing

A Student is deemed to be in good academic standing in the University if he obtains a Cumulative Grade Point Average (CGPA) of not less than 1.50 at the end of an academic session. However, a programme, subject to the approval of Senate, may use higher CGPA than 1.50 as the minimum to be in Good Academic Standing for that programme.

5.22. Probation

A student whose CGPA falls short of the minimum required to be in good academic standing for the first time may be placed on probation for only one semester on Senate approval of a prayer to that effect from the Dean of his college arising from the recommendation of the College Board.

5.23. Withdrawal after probation

i. A student who after probation fails to attain the minimum CGPA required in his programme shall be advised to withdraw from the programme. He may, however, seek transfer to any other programme in the same college or another college for which he has pre-requisite qualification for admission.

ii. If he again fails to attain the minimum CGPA in his new programme, he will be advised to withdraw from the university.

5.24. Maximum Time Allowed for a Degree

The maximum time allowed for any student to run a degree programme is one and a half times the minimum, to the higher whole number where fractions result.

5.25. Classification of Degrees

The National Universities Commission has cancelled the award of Pass degrees in Nigerian universities. Only Honours degrees are awarded as follows:

First class	CGPA	4.50 – 5.00
Second Upper	CGPA	3.50 – 4.49
Second Lower	CGPA	2.40 – 3.49
Third	CGPA	1.50 – 2.39

5.26. Aegrotat Degree

i. Candidate who is absent by reason of illness from the final terminal degree examination may sit for it at the approved next available opportunity which shall fall within the maximum allowable years for the programmes;

ii. A candidate who is admitted to an examination under (a) above but is again absent by reason of illness from the whole examination or part thereafter shall be permitted either to take it at the approved next available opportunity within the maximum allowable years for the programme with or without retaking the final year courses or to apply for Aegrotat Degree subject to sections (c) –(i) below:

iii. No student who has not earned up to 70% of credit units required for graduation in his/her programme shall be granted an Aegrotat Degree;

iv. Any application for an Aegrotat Degree shall be sent to the Registrar and must be accompanied by a Certificate of illness issued by the Director of the University Health Services indicating that the candidate was too ill to take examination;

v. The Registrar upon receipt of the application, shall transmit same to the concerned College Board of Examiners through the College Dean;

vi. The College Board of Examiners shall make recommendation for approval of Senate;

vii. If approved, an Aegrotat Degree shall be awarded without Distinction or Class to the candidate;

viii. Any approved Aegrotat Degree shall be clearly so stated in the certificate, for example, B.Sc (Aegrotat) in that programme; and

ix. Aegrotat Degree is a terminal Degree.

5.27. Absence from the University

i. Any student who fails to register for his course during the stipulated period shall be deemed to have withdrawn from that course. Course advisers must collate names of such students and submit to the Head of Department.

ii. Such student must apply for suspension of his studies before the end of the semester, and his application must be supported by cogent, verifiable and acceptable reason(s).

iii. Otherwise such student shall be deemed to have withdrawn from the programmed.

5.28. Absence from Examination

i. A student who, having duly registered and qualified to write the examination by virtue of optimum attendance at lectures, fails to present himself for the examination shall be scored what he/she has in CA in the examination and a grade of F except there is an earlier application, supported by cogent and verifiable reason(s), to absent himself from the examination and approval given.

ii. A student who absents himself from an examination may apply to be allowed to sit for the examination at the next available opportunity if his application in above was approved. His attempt of the examination shall then be treated as a first attempt.

5.29. Regulations Governing the Conduct of Examinations

5.29.1. General

i. University Examinations: University Examinations include semester, Professional and other examinations involving the active participation of Department, College and Registry (Examination Office)

ii. Continuous/Progressive Assessment: This means course tests, tutorials, laboratory practicals, fieldwork and other graded assignments organized by the course examiner for the purpose of determining the level of performance of each student in that course.

5.29.2. Eligibility for Examination:

All students duly registered for any course are eligible to write examination in such course except;

i. student who fails to attend up to 70% of instructions (lectures, tutorials, practicals) of the course .

ii. student on suspension / rustication for whatever reasons.

5.29.3. Examination Accommodation

i. All university examinations shall be held in halls, rooms or laboratories approved by the Senate;

ii. Seating arrangement shall be such as to facilitate ease of reach of any student by an invigilator;

iii. Clock(s) from which time for the examination can be determined shall be prominently displayed and be visible to all students seated in the examination hall.

5.29.4. Examination Materials

The University Examinations officer shall arrange the supply of the following materials for use before, during or after each examination.

i. Approved form for Draft Examination Question Papers.

ii. Answer booklets and supplementary sheets, Graph papers where needed, all perforated at the top left-hand corner, and strings, stapling machine and pins, and large brown envelopes for packing Answer booklets.

iii. Attendance Register for each course and the list of students registered for the course.

iv. Examination misconduct Report sheets.

v. Four-figure Table, Statistical Table, Charts, design aids and any other authorized materials.

5.29.5. Medical Facility

The University Health Centre shall provide one of its personnel on standby in the Examination Hall with First Aid materials and the ambulance for emergency cases.

5.29.6. Conduct of Examinations

Instructions to Candidates on Examination

i. Students shall always ensure that they acquaint themselves with the examination regulations

ii. Candidates shall attend punctually at the time scheduled for their papers. Candidates arriving 30 minutes after the start of the examination shall be admitted only at the discretion of the Chief Invigilator

iii. Candidates shall bring into the examination hall their own pen, pencil, ruler, eraser and any other material which are permitted. Candidates will not be allowed to borrow any writing material from colleagues.

iv. No textbook, lecture note, jottings or scraps of paper shall be brought into the examination hall.

v. Handbags, carry-all, electronic calculator and cell-phones are not permitted in the examination hall.

vi. Candidates shall keep strictly to the seating arrangement as laid down by the Chief Invigilator;

vii. Once in the examination hall, communication by whatever means between candidates is totally prohibited and anyone caught shall be charged with examination misconduct. Attention of the Invigilator is called for anything by the raising up of hand.

viii. Smoking in the examination hall before, during or after the examination is prohibited. In fact, smoking on the University campuses is prohibited and anyone caught shall be charged with misbehavior.

ix. Use of scrap paper for rough work in the examination is prohibited. All rough work must be done inside the Answer booklet and neatly cancelled.

x. The Answer booklet as well as supplementary sheet is the property of the university. It must not be mutilated, torn, destroyed or taken away by any student. Any student found contravening this is chargeable with attempted examination malpractice and social misbehavior.

xi. Candidates taking Mathematics, Engineering Drawing and similar courses must bring their own instruments which will contain compass and dividers, diagonal scales, set squares and protractors. Personal Mathematical Tables shall not be allowed in the examination hall.

xii. Before handing over the Answer booklet, candidates must ensure that:

(a) details of the examination are entered on the front cover of the booklet,

(b) your matriculation number is legibly written at the back of the answer booklet,

(c) number of every question answered is entered in correct sequence on the answer booklet,

(d) all rough work is neatly crossed out, and

(e) all supplementary sheets used are neatly placed in the Answer booklet and securely tied in.

xiii. Candidates must not write their names on the examination answer booklet. Only the Matriculation Number must be indicated to identify the owner of a booklet.

xiv. Every candidate must ensure that he personally hands his Answer Booklet to the Invigilator and sign out the Attendance register.

xv. Candidates must not leave the examination hall with any university property except the question paper provided you are not instructed to submit it.

xvi. Under no circumstance shall a candidate write the answer to any test or examination questions outside the venue designated for such exercise.

xvii. Candidates shall not be allowed to submit their Answer Booklets or leave the Examination Hall within the first 30 minutes and the last 15 minutes of the examination.

xviii. At the end of the examination, candidates shall remain quietly seated as the invigilator(s) go from row to row to collect their Answer booklets.

xix. All Post-examination discussions among candidates can only take place outside the examination hall.

xx. Use of calculators in the examination;

(a) Any candidate hoping to use calculator in the examination shall come with his own calculator. There shall be no borrowing of calculator in the examination hall,

(b) Candidates shall be allowed the use of electronic calculators except programmable ones,

(c) Calculator must be small (hand-held) and battery or solar powered,

(d) Responsibility for correct operation of the calculator rests with the candidate alone and no account shall be taken for machine failure,

(e) The calculator is switched off on entry into the examination hall,

(f) Only one calculator per student is allowed,

(g) Candidates shall make available their calculators for inspection by the invigilator on entering into the examination hall and any time during the examination that it is so demanded.

(h) Class practical instruction manuals are prohibited except specifically requested to be allowed in by the examiner.

5.30. Examination Rules and Regulations

Any of the following shall, prima facie, constitute examination irregularity or misconduct:

5.30.1. Irregularity

Irregularity shall be deemed to have occurred if the candidate sits for an examination for which he/she is not eligible, as may occur when the candidate:

i. Does not register for the approved course.
ii. Does not satisfy the attendance requirements of 70%.
iii. Has not complied with any other requirement(s) prescribed by the Senate, College or Department.

Sanctions: Candidates whose positions are irregular as identified under this heading shall not be allowed to sit for the examination. Where the irregularity is discovered after the candidate might have sat for the examination, such paper(s) done under irregular conditions shall be nullified.

5.30.2. Misconduct

Misconduct shall be deemed to have occurred under the following conditions:

i. Failure to observe silence. The only permissible way for attracting the attention of the invigilator is by the candidate raising of his/her hand.
ii. Smoking in the examination hall or rooms when an examination is in progress.
iii. Act(s) of insubordination or insolence to the invigilator(s).
iv. Fighting in the examination hall.
v. Any act(s) of commission or omission that may negatively affect the smooth conduct of the examination.

Sanctions: All cases of misconduct shall attract a written warning issued by the Dean and copied the Registrar. Except that candidates guilty of (iv) shall in addition have their cases referred to Students' Disciplinary Committee. Examination misconduct shall be deemed to have occurred under the following:

i. Any act of omission which contravenes any of the provisions of section 3(2) of the Miscellaneous Offences Decree of 1984.

ii. Any unlawful attempts, acts, omissions, successful or unsuccessful, directed at obtaining pre-knowledge of examination question(s) or influencing the marking of scripts or award of marks by the University or External Examiner.

iii. Any attempt, successful or unsuccessful, to impersonate a candidate in any University examination.

The following shall constitute impersonation:

a) Writing examination for a candidate.
b) The exchange of examination numbers or names or answer scripts/sheets.
c) The intentional use of someone else's examination number.

iv. Introduction of relevant foreign materials and cheat notes into the examination hall, whether used (copied from, consulted) or not. Relevant materials shall be taken to refer to any material that is considered to be relevant to the subject matter or course being examined irrespective of whether it is relevant to the specific examination questions of the subject matter/course or not.

v. Exchange of relevant materials in the examination hall while the examination is in progress. These materials may involve any of the following:-

a) Question paper containing relevant jotting and materials
b) Collaborated copying
c) Exchange of answer scripts.

vi. Any unlawful attempt, whether successful or unsuccessful, to:

a) Remove submitted examination answer script(s) materials;
b) Alter, add or delete any written materials in the submitted answer script(s) after the examination;
c) Replace submitted examination script(s) with extraneous one after the examination, either in part or in whole;
d) Submit manuscript not written under supervision in the examination hall during or after the examination;
e) Destroy submitted examination scripts or materials by fire or any other method.

vii. Theft/removal of examination scripts/materials, whether used or not.

viii. Consulting notes and other relevant materials outside the examination hall when such a candidate has not yet submitted his/her script(s).

ix. Assisting, facilitating, adding or abetting cheating.

x. Leaving the examination room without permission, and later returning to continue with the examination.

xi. Receiving or giving irregular assistance.

xii. Non-submission or incomplete submission of answer scripts.

xiii. Un-collaborated copying ("giraffing").

xiv. Writing on question papers/scripts, instead of the examination booklets and sheets supplied by the University.

xv. Speaking/Conversation during examination in spite of a warning.

Sanctions

i. Expulsion: A candidate found guilty of any examination misconduct (a) and (h) above shall be punished by expulsion.

ii. Rustication: A candidate found guilty of any examination misconduct (i) to (k) above shall be punishable by rustication for a minimum period of one academic year. A student who is so suspended shall, upon his/her return, continue with the academic programme where he/she had stopped.

iii. Cancellation of Relevant Examination Paper(s) A candidate found guilty of any examination misconduct (i) to (o) above shall be punishable by cancellation of the relevant examination paper(s). Any candidate whose paper is so cancelled shall be required to carry over the affected course(s).

5.31.ABBREVIATIONS

I General

C	Compulsory or Core
Cr	Concurrent
E	Elective
L	Lecture-hour
O	Optional
PR	Pre-requisite
Pr	Practical
R	Required
T	Tutorial
U	University

II Relating to Programme connotes course in

B.Eng.	Bachelor of Engineering
BIO	Biology
BME	Biomedical Engineering
CEN	Computer Engineering
CHM	Chemistry
COET	College of Engineering and Technology
CGPA	Cumulative Grade Point Average
EEE	Electrical and Electronics Engineering
GPA	Grade Point Average
GST	General Studies
MTH	Mathematics
MTE	Mechatronics Engineering
PHY	Physics
STA	Statistics
TEN	Telecommunication Engineering

5.32. Other University Services Available to Students

i The University Health Centre provides preventive and curative Health care to all students of the Achievers University, Owo, Nigeria.

ii Library services are available to the students upon registration with the University Library.

iii Sport center is available for sporting activities for all the students in Achievers University, Owo

5.33 Academic Atmosphere

This is defined as any policy adopted and practiced by the college/department in pursuit of academic standard and maintenance of academic quality. The department has a curriculum development committee which reviews the curriculum when there is a need for one. This is presented in the staff meeting. The curriculum is then passed to the school curriculum development committee which makes recommendation to the school Board of Studies. The Board of Studies consist of all teaching staffs in the college. The Board of Studies scrutinizes the curriculum and makes recommendations to the Senate. The curriculum development committee of the Senate scrutinizes the syllabus before it is passed to the Senate for approval.

There are departmental/programme seminars. Apart from staff seminars, students also are to present seminars on their research projects and topics arising from their experiences during SIWES. Each 500L student presents two seminars per session. Seminars are organized, advertised and conducted by the Academic Staff in charge of the seminar.

Apart from individual staff research, departmental research and consultancy are normally encouraged. Academic publications in conferences and journals are also encouraged. Such publications are usually sponsored partially by the University and in principle, the University supports Staff for local and international conferences.

8. COURSE OUTLINES FOR B.ENG. ELETRICAL AND ELECTRONICS ENGINEERING

8.1 INTRODUCTION

The Bachelor of Engineering degree in Electrical and Electronics Engineering is a five-year or ten semester duration programme for students admitted by UTME into 100 level and four-year or eight semester duration programme for students admitted by Direct Entry into 200 level. In both circumstances, three industrial training schedules are undertaken before the completion of the programme. At 100 level, all enrolled students offer courses in Mathematics, Physics, Chemistry and some University approved general courses to enable flexibility in situations like inter-school transfers. Similarly, at 200 level, the students offer common general engineering and some University approved general and entrepreneurial courses to further enable ease of inter-departmental transfers. Also, at this level, the students begin to take foundational courses in Electrical and Electronics Engineering. At the end of the academic activities, all students are engaged on an eight-week Students Work Experience Programme (SWEP) during the long vacation for practical training in any engineering facility on general engineering works. Then at 300 level, the students are introduced to the various Electrical and Electronics Engineering courses while in addition, offer some core Electrical and Electronics Engineering and University approved general and entrepreneurial courses. At this level, training in core Electrical and Electronics Engineering begins. Also, at the end of this session, students engage in an eight weeklong Students' Industrial Work Experience Scheme (SIWES I) during the long vacation in any industry that applies Electrical and Electronics Engineering. At 400 level, more core coursework in Electrical and Electronics Engineering are undertaken in the first semester while in the second semester and long vacation, students proceed on a six month Students' Industrial Work Experience Scheme (SIWES II) for more training in the industry. At 500 level, students offer some fairly advanced Electrical and Electronics Engineering courses coupled with engineering management and law courses that are common to all in the college of engineering. They are also to present seminars and take some elective courses in the options of power system, electronics and communication, control and instrumentation engineering. At this same level, the students are to also undertake individual research project work under the supervision of an academic staff.

8.1.1 Graduation Requirement

The minimum graduation requirements for a degree of B.Eng. Electrical and Electronics Engineering is by obtaining a pass in at least a total of 215 prescribed credits subdivided into 100, 200, 300, 400, and 500 level for UME entry; and 1, 128 for Direct entry to 200 and 300 levels respectively. The Direct entry students are required to pass the 10 credits of GST offered at 100 level in addition to 200, 300, 400, and 500 levels courses as the UME entry.

8.1.2 100 Level: Total Credit Units: 45

B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 100 LEVEL FIRST SEMESTER COURSES						
Course Code	**Description**	**Unit**	**STATUS**	**CONTACT HOURS/WEEKS**		
				L	**P**	**T**
CHM103	General Physical Chemistry I	3	C	3	-	-
CHM105	General Chemistry Practical I	1	C	-	3	-
GST111	Communication in English I	2	C	2	-	-
GST113	Nigerian People and Culture	2	C	2	-	-
GST121	Use of Library Study Skills and ICT	2	C	2	-	-
GST123	Communication in French	2	C	2	-	-
MTH101	General Mathematics I	3	C	3	-	-
MTH103	General Mathematics II	3	C	3	-	-
PHY101	Mechanics & Properties of Matter	2	C	2	-	-
PHY107	Practical Physics I	1	C	-	3	-
PHY111	Heat, Sound and Optics	2	C	2	-	-
AUC101	Achievers University Concept I	-	R	1	-	-
	Total Units:	**23**				

B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 100 LEVEL SECOND SEMESTER COURSES						
Course Code	**Description**	**Unit**	**STATUS**	**CONTACT HOURS/WEEKS**		
				L	**P**	**T**
CHM104	General Chemistry II	3	C	3	-	-
CHM106	Chemistry Practical II	1	C	-	3	-
GST122	Communication in English II	2	C	2	-	-
GST 112	Logic, Philosophy, and Human Existence	2	C	2	-	-
MTH102	Elementary/General Mathematics III (Calculus real Analysis)	3	C	3	-	-
MTH104	Elementary/General Mathematics IV (Basic Algebra)	3	C	3	-	-
MEE102	Applied Mechanics I	3	C	2	-	1
PHY102	Electricity & Magnetism I	2	C	2	-	-
PHY108	Practical Physics II	1	C	-	3	-
PHY122	Atomic & Nuclear Physics	2	C	2	-	-
AUC 102	Achievers University Concept II	-	R	1	-	-
	Total Units:	**22**				

8.1.3 200 Level: Total Credit Units: 46 + 6 = 52 (SWEP: 10 weeks during long vacation between 200 level and 300level)

B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 200 LEVEL FIRST SEMESTER COURSES

Course Code	Description	Unit	STATUS	CONTACT HOURS/WEEKS		
				L	P	T
CEN201	IT in Engineering	2	C	2	-	-
EEE201	Basic Electrical and Electronics Engineering I	3	C	2	**3**	-
EEE203	Engineering Mathematics I	3	C	3	-	-
ESP 223	Introduction to Entrepreneurship Skills I	2	C	2	-	-
GST211	History and Philosophy of Science	2	C	2	-	-
MEE201	Engineering Drawing I	2	C	1	3	-
MTE203	Engineers in Society	1	C	1	-	-
MEE203	Engineering Workshop Practice	1	C	-	3	-
CVE201	Strength of Materials I	2	C	2	-	-
CVE203	Fundamental of Fluid Mechanics	2	C	2	-	-
MEE205	Manufacturing Technology I	3	C	2	3	-
	Total Units:	**23**				

B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 200 LEVEL SECOND SEMESTER COURSES						
Course Code	**Description**	**Unit**	**STATUS**	**CONTACT HOURS/WEEKS**		
				L	**P**	**T**
BME204	Engineering Material Science	2	C	2	-	-
CEN202	Computer Programming and Applications	3	C	2	3	-
EEE202	Basic Electrical and Electronics Engineering II	2	C	1	3	-
EEE204	Measurement and Instrumentation	3	C	2	3	-
EEE 206	Engineering Mathematics II	3	C	3	-	-
GST 222	Peace Studies and Conflict Resolution	2	C	2	-	-
MEE202	Engineering Drawing II	2	C	1	3	-
MEE204	Fundamental of Thermodynamics	3	C	3	-	-
MEE206	Mechanics of Machine I	3	C	3	-	-
EEE 220	Students Work Experience Programme (SWEP)	6	C	**10 weeks**		
	Total Units:	**23+ 6 (SWEP)**				

Long Vacation Training

COURSE CODE	COURSE TITLE	Unit	STATUS	CONTACT HOURS		
				L	T	P
EEE 220	SWEP (Student Work Experience Programme)	6	C	0	0	10 weeks

8.1.4 300 Level: Total Credit Units: 44+6 = 50 (SWEP: 10 weeks during long vacation between 300 level and 400level)

B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 300 LEVEL FIRST SEMESTER COURSES						
Course Code	**Description**	**Unit**	**STATUS**	**CONTACT HOURS/WEEKS**		
				L	**P**	**T**
CEN301	Computer Software Engineering Laboratory	2	C	2	-	-
EEE301	Computer Network and Data Communication	3	C	3	-	-
EEE303	Electric Circuit Theory I	3	C	2	3	-
EEE305	Electronics Engineering I	3	C	2	3	-
EEE307	Electromagnetic Field Theory	2	C	2	-	-
EEE309	Signals and Systems	2	C	1	3	-
EEE 311	Engineering Mathematics III	3	C	3	-	-
EEE313	Electromechanical Devices and Machines I	2	C	2	-	-
EEE315	Electrical and Electronics Lab. I	1	C	-	3	-
ESP311	Introduction to Entrepreneurial Studies II	2	C	1	3	-
	Total Units:	**23**				
B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 300 LEVEL SECOND SEMESTER COURSES						
Course Code	**Description**	**Unit**	**STATUS**	**CONTACT HOURS/WEEKS**		
				L	**P**	**T**
CEN302	Technical Report and Communication	2	C	2	-	-
EEE302	Electromechanical Devices and Machines II	3	C	3	-	-
CEN304	Software Development Techniques	3	R	2	3	-
EEE306	Electric Circuit Theory II	2	C	1	3	-
EEE308	Electrical and Electronics Lab. II	1	C	-	3	-
EEE310	Electromagnetic Wave Theory	2	C	2	-	-
EEE312	Engineering Mathematics IV	3	C	3	-	-
EEE314	Electronics Engineering II	3	C	2	3	-
EEE316	Introduction to Communication Engineering	2	C	2	-	-
	Total Units:	21				

LONG VACATION TRAINING

		Unit	**STATUS**	**CONTACT HOURS**

COURSE CODE	COURSE TITLE			L	T	P
EEE320	SIWES (Student Industrial Work Experience Scheme)	6	R		0	10 Weeks

8.1.5. 400 Level: (Total Credit Units: 22+ SIWES 6 Units = 28)

B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 400 LEVEL FIRST SEMESTER COURSES						
Course Code	**Description**	**Unit**	**STATUS**	**CONTACT HOURS/WEEKS**		
				L	**P**	**T**
BME401	Engineering Statistics	2	C	2	-	-
CEN 405	Assembly Language Programming	3	C	3	-	-
EEE401	Control System Engineering I	3	C	2	-	1
EEE403	Digital Electronics	3	C	2	3	-
EEE405	Electric Power Principles	2	C	2	-	-
EEE411	Electrical and Electronics Lab. III	1	C	-	3	-
EEE409	Engineering Computational Method	3	C	3	-	-
MTE401	Automation and Robotics I	3	C	2	3	-
MEE409	Engineering Economics & Accounting	2	C	2	-	-
	Total Units:	**22**				

B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 400 LEVEL SECOND SEMESTER COURSES						
Course Code	**Description**	**Unit**	**STATUS**	**CONTACT HOURS/WEEKS**		
				L	**P**	**T**
EEE 420	SIWES: Industrial Attachment	6	C	**24 Weeks**		
	Total Units:	**6**				

8.1.6. 500 Level: Total Credit Units: 40

B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 500 LEVEL FIRST SEMESTER COURSES						
Course Code	**Description**	**Unit**	**STATUS**	**CONTACT HOURS/WEEKS**		
				L	**P**	**T**

CEN503	Digital Signal Processing	3	C	3	-	-
EEE501	Design and Installation of Electrical and ICT Services	3	C	3	-	-
EEE503	Control Systems Engineering II	3	C	3	-	-
EEE505	Seminar	1	C	1	-	-
EEE507	Engineering Management	2	C	2	-	-
EEE597	Project 1	3	C	-	9	-
	Minimum of 4 units Electives	4				
	Total Units:	**19**				

ELECTIVES

1. POWER OPTION						
EEE509	Power System Engineering I	2	E	2	-	-
EEE511	Power Electronics Devices and Applications	2	E	2	-	-
2. ELECTRONICS AND TELECOMMUNICATION OPTION						
EEE513	Digital Communication	2	E	2	-	-
EEE515	Mobile and Wireless Communication Systems	2	E	2	-	-
3. CONTROL AND INSTRUMENTATION OPTION						
EEE517	Instrumentation Engineering	2	E	2	-	-
EEE519	Object Orientation Programming and Computer Simulation	2	E	2	-	-

B.ENG ELECTRICAL & ELECTRONICS ENGINEERING 500 LEVEL SECOND SEMESTER COURSES

Course Code	**Description**	**Unit**	**STATUS**	**CONTACT HOURS/WEEKS**		
				L	**P**	**T**
EEE502	Engineering Law	2	C	2	-	-
EEE504	Energy Conversion and Storage	3	C	3	-	-
EEE506	Embedded System Design and Programming	3	C	3	-	-
EEE508	Reliability and Maintainability of Systems	3	C	3	-	-
EEE510	Introduction to Smart Power Grid	3	C	3	-	-
EEE598	Project II	3	C	-	9	-
	Minimum of 4 units Electives	**4**				
	Total Units:	**21**				

ELECTIVES

1. POWER OPTION						
EEE512	Power System Engineering II	2	E	2	-	-
EEE514	High Voltage Engineering and Protection	2	E	2	-	-
EEE516	Power System Operation and Control	2	E	2	-	-
2. ELECTRONICS AND TELECOMMUNICATION OPTION						
EEE518	Antenna Theory and Radial System	2	E	2	-	-
EEE520	Radio and Television Broadcasting	2	E	2	-	-
3. CONTROL AND INSTRUMENTATION OPTION						
EEE522	Control Engineering III	2	E	2	-	-
EEE524	Process Control	2	E	2	-	-

KEY: U – Unit; L – Lecture; P – Practical; T - Tutorial; C – Core; R– Required; E - Elective

9. COURSE SYNOPSIS

COURSE CODE	COURSE DESCRIPTION	UNITS(S)
CHM103	**General Physical Chemistry I**	**3 UNITS**
	Atoms, molecules and chemical reactions, chemical equations and stoichiometry, atomic structure and periodicity modern electronic theory of atoms. Radioactive, chemical bonding, properties of gases. Equillibria and thermodynamics, chemical kinetics, electrochemistry. 45 Hours Lecture **Course Aims**: ➢ Understanding Physical Quantities and Units: Introduce students to physical quantities, units, and error treatments in experimental measurements. ➢ States of Matter and Gas Laws: Explore the behavior of matter in different states and apply the laws of gases to derive and calculate various properties. ➢ Mole Concept and Stoichiometry: Introduce the mole concept and its application in determining relative masses and chemical equations. Explore stoichiometric calculations involving chemical reactions. ➢ Atomic Structure and Periodic Table: Provide an overview of modern atomic theory, electronic configuration, and the periodic table, including trends in periodicity.	

	➢ Chemical Bonding and Intermolecular Forces: Explore chemical bonding, intermolecular forces, and their effects on chemical properties and behavior. ➢ Acids, Bases, and Salts: Introduce the concepts of acids, bases, and salts, and their reactions and properties. ➢ Chemical Equilibrium and Kinetics: Discuss chemical equilibrium, factors affecting reaction rates, and the principles of chemical kinetics. ➢ Thermochemistry and Electrochemistry: Introduce thermochemical principles, including heat changes in chemical reactions, and basic concepts in electrochemistry. ➢ Introduction to Nuclear Chemistry: Provide a basic understanding of nuclear chemistry, including nuclear reactions and their applications. **Learning Outcomes**: Upon completion of the course, students will be able to: ➢ Understand the principles of physical quantities, units, and error treatments in experimental measurements. ➢ Apply the gas laws to describe the behavior of gases under different conditions. ➢ Apply the mole concept and stoichiometry to solve problems involving chemical reactions and equations. ➢ Describe the structure of atoms, periodic trends, and the arrangement of elements in the periodic table. ➢ Explain chemical bonding, intermolecular forces, and their effects on the properties of substances. ➢ Describe the properties and reactions of acids, bases, and salts. ➢ Analyze chemical equilibrium systems and reaction kinetics. ➢ Apply thermochemical and electrochemical principles to describe energy changes in chemical reactions. ➢ Explain basic concepts in nuclear chemistry and nuclear reactions. By achieving these learning outcomes, students will develop a foundational understanding of chemistry principles and concepts, which will prepare them for further studies in chemistry and related fields. They will also acquire practical laboratory skills and techniques essential for experimental chemistry work. 45 Hours Lectures	
CHM104	**General Physical Chemistry II**	**3 UNITS**
	Historical survey of the development and important of organic. Chemistry nomenclature and classes of organic compounds; homologous series; functional groups; isolation and purification of organic compounds; Qualitative organic chemistry; stereo-chemistry;	

	determinations or structure of organic compounds; electronic theory in organic chemistry. **Course Aims:** ➢ Introduction to Organic Chemistry: Provide students with a fundamental understanding of organic chemistry, including the structure, properties, and reactivity of organic compounds. ➢ Nomenclature and Classes of Organic Compounds: Teach students the rules and conventions for naming organic compounds and familiarize them with the different classes of organic molecules. ➢ Functional Groups and Organic Reactions: Introduce students to the concept of functional groups and the types of organic reactions, including elimination, addition, substitution, and rearrangement reactions. ➢ Isomerism: Explain the principles of structural and stereoisomerism, and illustrate how isomerism affects the properties and behavior of organic compounds. ➢ Chemistry of Organic Compounds: Explore the chemistry of important organic functional groups, including alcohols, phenols, aldehydes, ketones, acids, amines, and amides, as well as the chemistry of benzene and other aromatic compounds. ➢ Biochemical Molecules: Discuss the structure and properties of important biochemical molecules such as sugars, polysaccharides, peptides, proteins, fats, and oils. ➢ Isolation and Purification Techniques: Familiarize students with common techniques used for the isolation and purification of organic compounds, including extraction, distillation, chromatography, and crystallization. **Learning Outcomes:** Upon completion of the course, students will be able to: Upon completion of the course, students will be able to: ➢ Identify and classify organic compounds based on their functional groups and structural characteristics. ➢ Name organic compounds using IUPAC nomenclature rules and conventions. ➢ Understand the mechanisms and reactions involved in various types of organic reactions, including elimination, addition, substitution, and rearrangement reactions. ➢ Recognize and differentiate between different types of isomerism, including structural and stereoisomerism. ➢ Explain the chemical properties and reactions of important organic functional groups. ➢ Describe the structure, properties, and functions of key biochemical molecules found in living organisms.	

	➢ Apply isolation and purification techniques to separate and purify organic compounds from complex mixtures. ➢ Through lectures, laboratory experiments, and problem-solving exercises, students will develop a solid foundation in organic chemistry principles and techniques, preparing them for further study in chemistry and related fields.	
CHM105	**General Chemistry Practical I**	**1 UNIT**
	Practical on all the contents of general chemistry I 15 Hours Practical **Course Description:** CHM 105 General Chemistry Practical I is a laboratory-based course that serves as a practical extension of the theoretical principles covered in CHM 102. The course focuses on organic functional groups and purification techniques essential for understanding and applying principles of organic chemistry. Through a series of hands-on experiments, students will explore various organic functional groups and learn purification techniques such as recrystallization and distillation. This course provides students with practical skills and experience in organic chemistry laboratory procedures, enhancing their understanding of chemical concepts and fostering critical thinking and problem-solving skills. **Aim:** The aim of CHM 105 is to provide students with practical experience in organic chemistry laboratory techniques and reinforce theoretical concepts learned in CHM 102. By engaging in laboratory experiments focused on organic functional groups and purification methods, students will develop proficiency in experimental techniques, data analysis, and scientific reasoning. The course aims to cultivate a deeper understanding of organic chemistry principles and promote the application of theoretical knowledge in practical laboratory settings. **Learning Outcomes:** Upon successful completion of CHM 105, students will be able to: ➢ Perform laboratory experiments to identify organic functional groups and characterize organic compounds based on their chemical properties. ➢ Demonstrate proficiency in the use of laboratory equipment and techniques for organic compound purification, including recrystallization and distillation. ➢ Analyze experimental data, interpret observations, and draw conclusions regarding the composition and properties of organic compounds.	

- Apply safety protocols and good laboratory practices to ensure a safe working environment and accurate experimental results.
- Demonstrate effective communication skills in recording experimental procedures, observations, and results in laboratory reports.
- Apply principles of stoichiometry and chemical calculations to determine reaction yields, purity of compounds, and other quantitative aspects of experimental data.
- Evaluate the efficiency and effectiveness of purification techniques in isolating and characterizing organic compounds.
- Collaborate with peers in laboratory settings, demonstrating teamwork, cooperation, and mutual respect.
- Identify sources of error in laboratory experiments and propose strategies to minimize or mitigate their impact on experimental results.
- Reflect on laboratory experiences and outcomes, identifying areas for improvement and further exploration in organic chemistry laboratory practice.

Course Title: CHM 106 Practical Chemistry II

Course Description:
Practical on all the contents of general chemistry I

Course Aims:
- Identification of Organic Functional Groups: Enable students to perform qualitative tests to identify common organic functional groups, including unsaturated hydrocarbons, alcohols, aldehydes, ketones, carboxylic acids, esters, and phenols.
- Melting Point Determination: Familiarize students with the technique of melting point determination as a means of assessing the purity and identity of organic compounds.
- Solvent Selection for Recrystallization: Teach students how to select suitable solvents for recrystallization based on the solubility characteristics of organic compounds.
- Separation by Distillation: Introduce students to the process of distillation for the separation and purification of organic compounds based on differences in boiling points.

Learning Outcomes:
Upon completion of the course, students will be able to:
- Perform qualitative tests to identify common organic functional groups, including unsaturated hydrocarbons, alcohols, aldehydes, ketones, carboxylic acids, esters, and phenols.
- Conduct melting point determinations to assess the purity and identity of organic compounds.
- Select appropriate solvents for recrystallization based on the solubility characteristics of organic compounds.
- Perform recrystallization techniques to purify organic compounds and obtain crystals of high purity.

	➢ Apply distillation techniques to separate and purify organic compounds based on differences in boiling points. ➢ Interpret experimental data and observations to draw conclusions regarding the identity and purity of organic compounds.	
CHM106	**General Chemistry Practical II**	**1 UNIT**
	Practical on all the contents of General Chemistry II 15 Hours Practical **Course Description:** Practical on all the contents of general chemistry I **Course Aims:** ➢ Identification of Organic Functional Groups: Enable students to perform qualitative tests to identify common organic functional groups, including unsaturated hydrocarbons, alcohols, aldehydes, ketones, carboxylic acids, esters, and phenols. ➢ Melting Point Determination: Familiarize students with the technique of melting point determination as a means of assessing the purity and identity of organic compounds. ➢ Solvent Selection for Recrystallization: Teach students how to select suitable solvents for recrystallization based on the solubility characteristics of organic compounds. ➢ Separation by Distillation: Introduce students to the process of distillation for the separation and purification of organic compounds based on differences in boiling points. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Perform qualitative tests to identify common organic functional groups, including unsaturated hydrocarbons, alcohols, aldehydes, ketones, carboxylic acids, esters, and phenols. ➢ Conduct melting point determinations to assess the purity and identity of organic compounds. ➢ Select appropriate solvents for recrystallization based on the solubility characteristics of organic compounds. ➢ Perform recrystallization techniques to purify organic compounds and obtain crystals of high purity.	

	➢ Apply distillation techniques to separate and purify organic compounds based on differences in boiling points. ➢ Interpret experimental data and observations to draw conclusions regarding the identity and purity of organic compounds.	
GST111	**Communication in English I**	**2 UNITS**
	Effective communication and writing in English; study skills, language skills, writing of essay answers, Instruction and lexis, sentences, construction and organization of material and logical presentation, punctuation and logical presentation of papers, use of Library, phonetics, Art of public speaking and oral communication. **Course Description**: Communication in English I is a foundational course designed to enhance students' English language skills, with a focus on listening and speaking. The course covers listening strategies, note-taking techniques, pronunciation skills, grammatical structures, vocabulary development, common errors, and effective communication strategies. **Course Aims**: ➢ Listening Skills: Develop students' ability to effectively listen to English language content, including lectures, conversations, and audio materials. Focus on strategies for active listening and note-taking. ➢ Speaking Skills: Improve students' speaking proficiency by focusing on segmental consonants, vowels, stress, intonation, and pronunciation. Encourage students to practice speaking English fluently and accurately. ➢ Grammar and Vocabulary: Introduce students to essential grammatical structures, including nouns, verbs, pronouns, adverbs, prepositions, and adjectives. Expand students' vocabulary through exposure to common words and phrases. ➢ Effective Communication: Teach students the fundamentals of effective communication, including sentence structure, punctuation marks, vocabulary development, and common figures of speech. Help students develop clarity, coherence, and conciseness in their communication. ➢ Reading and Texts: Introduce students to recommended texts to enhance their reading comprehension and language proficiency. Encourage critical reading and analysis of English language materials. **Learning Outcomes**: Upon completion of the course, students will be able to:	

	➢ Apply effective listening strategies and techniques to comprehend English language content. ➢ Demonstrate improved pronunciation skills, including segmental consonants, vowels, stress, and intonation. ➢ Identify and use basic grammatical structures, including nouns, verbs, pronouns, adverbs, prepositions, and adjectives, in spoken and written communication. ➢ Expand their English vocabulary and use appropriate words and phrases in various contexts. ➢ Employ effective communication strategies, including sentence structure, punctuation, and figures of speech, to convey ideas clearly and concisely. ➢ Develop confidence in speaking English fluently and engaging in meaningful conversations. ➢ Utilize note-taking skills to summarize and retain information from spoken presentations and lectures. ➢ Through active engagement in listening, speaking, reading, and writing activities, students will develop a strong foundation in English language communication, essential for academic and professional success. 30 Hours Lecture	
GST112	**Logic, Philosophy and Human Existence**	**2 UNITS**
	Survey of the branches of philosophy, foundation of logic, critical thinking, types of discourse, nature of Arguments, techniques for evaluating Arguments, deductive Arguments, Inductive Arguments, Validity and soundness of Arguments. **Course Description:** GST112 is designed to introduce students to fundamental concepts in philosophy, logic, and human existence. The course explores various philosophical perspectives on human existence, the role of philosophy in society, and the importance of logical reasoning in understanding the world. Through critical reflection and analysis, students gain insights into ethical conduct, cultural values, and the significance of philosophy in national development. **Course Aims:** ➢ Understanding Human Existence: Introduce students to the concept of human existence and its philosophical foundations, including the meaning of life, ethical principles, and societal values. ➢ Philosophical Inquiry: Explore the methods and applications of philosophy in addressing fundamental questions about human existence, ethics, culture, and religion.	

	➢ Role of Philosophy in Society: Examine the relevance of philosophy to societal development, including its impact on education, language, and human conduct. ➢ Logical Reasoning: Provide students with an understanding of basic logical principles, including the nature of logic, types of arguments, logical fallacies, and truth tables. ➢ Philosophy of Language: Discuss the relationship between language and philosophy, including the nature of linguistic meaning and its implications for philosophical inquiry. ➢ Meaningful Life: Help students develop critical thinking skills and reasoning abilities essential for leading a purposeful and meaningful life. **Learning Outcomes**: Upon completion of the course, students will be able to: ➢ Articulate the fundamental concepts and theories related to human existence, ethics, culture, and religion. ➢ Evaluate the role of philosophy in addressing existential questions and societal challenges. ➢ Analyze philosophical texts and arguments using logical reasoning and critical thinking skills. ➢ Identify logical fallacies and construct valid arguments using truth tables and symbolic logic. ➢ Reflect on the significance of language in philosophical inquiry and communication. ➢ Apply philosophical principles to ethical decision-making and social issues in contemporary society. Demonstrate an understanding of the relationship between philosophy, education, and personal development 30 Hours Lecture	
GST113	**Nigerian People and Culture**	**2 UNITS**
	Study of the History and culture Pre-colonial times, Nigerian perceptions of his world, Nigerian culture and the characteristics, evolution of Nigeria as a political unit, concepts of Fundamental education, National Economy, social justice, Individual and national development, norms and values, moral Obligations of Citizens, environmental Sanitation. **Course Description:** GST 113 provides an in-depth exploration of the diverse cultural landscape of Nigeria, examining its historical, philosophical, and contemporary dimensions. The course delves into the rich tapestry of	

	Nigerian culture, analyzing its evolution, traditional practices, political institutions, and responses to globalization. Through critical examination, students will gain a nuanced understanding of Nigerian culture and its dynamic interplay with the global community. **Aim:** The aim of GST 113 is to equip students with comprehensive knowledge and critical insights into the complexities of Nigerian culture, history, and societal dynamics. By exploring various aspects of Nigerian life, the course seeks to foster cultural appreciation, critical thinking, and a deeper understanding of the country's place in the global context. **Learning Outcomes:** Upon successful completion of GST 113, students will be able to: ➢ Demonstrate a thorough understanding of the concepts of culture, civilization, and cultural change, with a focus on Nigeria as a case study. ➢ Analyze the dynamics of culture change in Africa and its implications for Nigerian society. ➢ Identify and evaluate the sources available for the study of Nigerian culture and history. ➢ Describe the key characteristics of culture areas in Nigeria and their significance. ➢ Examine the evolution of Nigerian political institutions from pre-colonial times to the present, including the impact of indirect rule and modern governance structures. ➢ Evaluate the role of traditional education, religion, and management practices in shaping Nigerian society. ➢ Critically assess the concept of national values and their relevance to contemporary Nigeria, including issues of citizenship, rights, and duties. ➢ Analyze Nigeria's foreign policy, its response to technological change, and its economic strategies in the context of globalization. ➢ Engage in discussions on social justice, democratic dialogue, and national security in Nigeria. ➢ Evaluate the role of institutions like the Independent Corrupt Practices and Other Related Offences Commission (ICPC) in promoting national values and integrity. **Course Title: GST 121 Use of Library and ICT** **Course Description**: Use of Library and ICT is a foundational course designed to introduce students to library resources, services, and information and communication technology (ICT) tools. The course covers topics such as library organization, library automation, online databases,	

and basic computer skills including knowledge of operating systems, computer hardware, and open-source applications.

Course Aims:

- Introduction to Libraries: Provide students with an overview of different types of libraries, library organization, and the services offered by libraries.
- Library Resources and Services: Familiarize students with various library resources such as serials, reference collections, and online databases. Teach students how to access and utilize these resources effectively.
- Library Rules and Regulations: Educate students on library rules and regulations, including borrowing policies, code of conduct, and ethical use of information.
- Library Automation: Introduce students to library automation systems and their role in managing library operations, cataloging, and circulation.
- ICT Skills: Develop students' basic ICT skills including understanding of operating systems, computer hardware, and software applications.
- Online Databases: Provide hands-on experience with online databases commonly used in academic and research settings, such as TEEAL, MIT Courseware, HINARI, OARE, AGORA, etc.
- Open Source Applications: Introduce students to open-source applications and their equivalents to closed-source software.
- Navigation and Command Line Skills: Teach students how to navigate and use features of operating systems, including Linux desktop environments, basic command line operations, and file management.

Learning Outcomes:

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

- Understand the organization and services provided by libraries, including access to various resources and collections.
- Navigate and utilize online databases effectively for research and academic purposes.
- Demonstrate basic ICT skills including knowledge of operating systems, computer hardware, and software applications.
- Follow library rules and regulations regarding the use of library resources and facilities.
- Utilize open-source applications as alternatives to closed-source software for various tasks.
- Navigate Linux desktop environments and perform basic command line operations for file management and system tasks.
- Through hands-on experience and practical exercises, students will develop essential skills in accessing and utilizing library resources and information technology tools, preparing them for academic success and lifelong learning.

	30 Hours Lecture	
GST121	**Use of Library Study Skills and ICT**	**2 UNITS**
	Use of library; types of libraries and their functions, special services to library clientele, relevance of catalogue to library resources materials such as; Practical the book and its parts, preservation and conservation of library operation resources, application of computer to library operation/library automation, copyrights law. **Course Description**: Use of Library and ICT is a foundational course designed to introduce students to library resources, services, and information and communication technology (ICT) tools. The course covers topics such as library organization, library automation, online databases, and basic computer skills including knowledge of operating systems, computer hardware, and open-source applications. **Course Aims**: ➢ Introduction to Libraries: Provide students with an overview of different types of libraries, library organization, and the services offered by libraries. ➢ Library Resources and Services: Familiarize students with various library resources such as serials, reference collections, and online databases. Teach students how to access and utilize these resources effectively. ➢ Library Rules and Regulations: Educate students on library rules and regulations, including borrowing policies, code of conduct, and ethical use of information. ➢ Library Automation: Introduce students to library automation systems and their role in managing library operations, cataloging, and circulation. ➢ ICT Skills: Develop students' basic ICT skills including understanding of operating systems, computer hardware, and software applications. ➢ Online Databases: Provide hands-on experience with online databases commonly used in academic and research settings, such as TEEAL, MIT Courseware, HINARI, OARE, AGORA, etc. ➢ Open Source Applications: Introduce students to open-source applications and their equivalents to closed-source software. ➢ Navigation and Command Line Skills: Teach students how to navigate and use features of operating systems, including Linux	

	desktop environments, basic command line operations, and file management. **Learning Outcomes**: Upon completion of the course, students will be able to: ➢ Understand the organization and services provided by libraries, including access to various resources and collections. ➢ Navigate and utilize online databases effectively for research and academic purposes. ➢ Demonstrate basic ICT skills including knowledge of operating systems, computer hardware, and software applications. ➢ Follow library rules and regulations regarding the use of library resources and facilities. ➢ Utilize open-source applications as alternatives to closed-source software for various tasks. ➢ Navigate Linux desktop environments and perform basic command line operations for file management and system tasks. ➢ Through hands-on experience and practical exercises, students will develop essential skills in accessing and utilizing library resources and information technology tools, preparing them for academic success and lifelong learning. 30 Hours Lecture	
GST122	**Communication in English II**	**2 UNITS**
	Sentence elements: Sentence types and varieties, punctuation and capitalization, Vocabulary Development – Homonyms, Synonyms, Autonyms, error identification and corrections, skills varieties of writing, the paragraph: Devices of coherence/Logical connector. Types of writing; Narration, description, exposition, Argumentation, report writing and memorandum: letter writing, informal and semiformal, speech writing. **Course Description:** Communication in English II is a continuation of the exploration of language skills, focusing on writing and reading comprehension. The course delves into various aspects of written communication, including essay writing, report writing, and literary analysis. Students will learn strategies for effective writing, paragraph development, and different types of writing genres. Additionally, the course covers reading comprehension and literary appreciation through the analysis of literary texts. **Course Aims:** ➢ Enhancing Writing Skills: Enable students to develop effective writing strategies and techniques for different types of writing, including essays, reports, and critiques.	

	➢ Understanding Writing Structure: Teach students the structure and organization of various types of writing, including essays, paragraphs, and reports, with an emphasis on coherence and clarity. ➢ Introduction to Report Writing: Familiarize students with the features and formats of technical and non-technical reports, including laboratory reports, project reports, and term papers. ➢ Developing Reading Comprehension: Enhance students' reading comprehension skills through the analysis and interpretation of literary texts and other written materials. ➢ Literary Appreciation: Introduce students to the elements and genres of literature, including fiction, poetry, and drama, and foster an appreciation for literary works. ➢ Application of Literary Features: Enable students to apply their understanding of literary features and genres to the analysis of recommended reading texts. ➢ Critical Thinking and Analysis: Encourage students to critically evaluate and analyze literary texts, identify themes, motifs, and literary devices, and articulate their interpretations effectively. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Demonstrate proficiency in different types of writing, including essays, reports, and critiques. ➢ Apply effective writing strategies for planning, organizing, and developing written content. ➢ Write coherent and well-structured paragraphs and essays, employing appropriate transitional devices. ➢ Produce technical and non-technical reports, adhering to the conventions of report writing. ➢ Comprehend and analyze literary texts, identifying themes, characters, and literary devices. ➢ Appreciate and evaluate various genres of literature, including fiction, poetry, and drama. ➢ Articulate critical interpretations of literary works, supported by evidence from the text. 30 Hours Lecture	
GST123	**Communication in French**	**2 UNITS**
	Introduction to French. Alphabet and numeracy. Effective communication (Written and oral). Conjugation of verbs in “er” form and other essential verbs such as: Aller, Venir, Finir, Avoir, Être, Descendre etc. Simple sentence construction. Comprehension and reading simple texts. **Course Description:**	

	GST 123 introduces students to the fundamentals of the French language with a focus on effective communication, both written and oral. The course covers essential aspects such as the French alphabet, numeracy, basic grammar including verb conjugations, and simple sentence construction. Through interactive learning activities, students will develop foundational skills in comprehension and reading of simple French texts. **Aim:** The aim of GST 123 is to provide students with a solid foundation in French communication skills, enabling them to engage in basic conversations, comprehend simple texts, and express themselves effectively in both written and oral formats. By mastering essential language elements and structures, students will develop the confidence to navigate basic communication situations in French-speaking contexts. **Learning Outcomes:** Upon successful completion of GST 123, students will be able to: ➢ Demonstrate proficiency in the French alphabet and numeracy, enabling them to accurately pronounce and write French words and numbers. ➢ Communicate effectively in basic French, both orally and in writing, using appropriate vocabulary and grammar structures. ➢ Conjugate common French verbs, including those ending in "er" and essential irregular verbs such as Aller, Venir, Avoir, Etre, Descendre, and Finir. ➢ Construct simple sentences in French, demonstrating comprehension of subject-verb agreement, tense usage, and word order. ➢ Read and comprehend simple French texts, including narratives, dialogues, and informational passages, to extract key information and understand basic messages. ➢ Engage in basic conversations in French, demonstrating the ability to introduce oneself, ask and answer questions, and exchange simple information. ➢ Apply effective communication strategies in various contexts, such as greetings, introductions, expressing opinions, and making simple requests. ➢ Demonstrate cultural awareness and sensitivity by recognizing basic cultural norms and practices associated with French-speaking communities. ➢ Utilize basic French language resources, such as dictionaries and online tools, to support language learning and communication. ➢ Reflect on their language learning progress and identify areas for improvement, taking initiative to further develop their French language skills beyond the classroom setting.	

	30 Hours Lecture	
MEE102	**Applied Mechanics I**	**3 UNITS**
	Vectors, operations with forces, resultants of coplanar force systems. Resultant of spatial force systems. Equilibrium and coplanar force systems. Center of gravity and center of mass. Newton's laws of motion and their applications, Friction and its applications. Impulse and momentum; Kinetic energy. Kinematics of a particle, composition and resolution of velocities and accelerations, relative velocity and acceleration, representation by vectors. Plane Kinematics of rigid body, angular velocity diagrams applied to simple mechanisms. Gyroscope. Instantaneous center of rotation. Equations of motion, linear momentum and moment of momentum. moment of inertia. Free vibrations of systems with one and two degrees of freedom including damping. Torsional vibration. 45 Hours Lecture **Course Description:** MEE 102 Applied Mechanics provides students with a comprehensive understanding of the principles and applications of mechanics in engineering contexts. The course covers fundamental concepts such as vectors, equilibrium, Newton's laws of motion, friction, impulse and momentum, kinetic energy, and kinematics of particles. Additionally, students will explore advanced topics including the center of gravity, spatial force systems, and the dynamics of free vibration systems. Through theoretical analysis and practical examples, students will develop problem-solving skills and gain insights into the mechanical behavior of engineering systems. **Aim:** The aim of MEE 102 is to equip students with the knowledge and skills necessary to analyze and solve mechanical problems encountered in engineering practice. By mastering the principles of applied mechanics, students will develop a solid foundation for designing and optimizing mechanical systems, understanding the behavior of materials, and ensuring structural integrity in engineering applications. **Learning Outcomes:** Upon successful completion of MEE 102, students will be able to: ➢ Apply vector principles to analyze and manipulate forces and moments in engineering systems. ➢ Calculate and determine the resultant of coplanar and spatial force systems using graphical and analytical methods.	

	➢ Analyze equilibrium conditions and solve problems related to coplanar force systems. ➢ Identify and calculate the center of gravity and center of mass of objects and systems. ➢ Apply Newton's laws of motion to analyze the dynamics of particles and systems under various conditions. ➢ Evaluate the effects of friction on mechanical systems and apply frictional force calculations in engineering contexts. ➢ Analyze impulse and momentum principles and their applications in collisions and dynamic systems. ➢ Calculate kinetic energy and its variation in mechanical systems. ➢ Analyze the kinematics of particles, including composition and resolution of velocities and accelerations, as well as relative velocity and acceleration concepts. ➢ Explain the principles and applications of gyroscopes in mechanical systems. ➢ Analyze and predict the behavior of free vibration systems using fundamental mechanical principles.	
MTH101	**General Mathematics I**	**3 UNITS**
	Algebra of set theory: Definition of concepts, laws of algebra of sets, Venn diagram and application. Real Numbers: Rational numbers, theory of surds, sequences and series (including AGP), binomial theorem, theory of quadratic, cubic and quartic equations, indices and logarithms, mathematical induction, partial fractions, theory of equations, inequalities and polynomials (including factor and remainder theorems). Complex Numbers: Algebra of complex numbers, Argand diagram, multiplication and division of numbers in polar form, nth root of unity, and DeMoivre's theorem, expansion of sin nØ, cos nØ, tan nØ. 45 Hours Lecture **Course Description:** General Mathematics I is designed to provide students with a strong foundation in algebra and trigonometry. The course covers fundamental concepts such as set theory, real numbers, complex numbers, and trigonometric functions. Students will learn to manipulate algebraic expressions, solve equations, and apply trigonometric functions to solve problems. **Course Aims:**	

	➢ Introduce Fundamental Concepts: Introduce students to elementary set theory, real numbers, complex numbers, and trigonometric functions, ➢ Develop Problem-Solving Skills: Develop students' problem-solving skills by applying algebraic and trigonometric techniques to solve equations and analyze mathematical problems, ➢ Establish a Strong Mathematical Foundation: Lay the groundwork for more advanced mathematical topics by establishing a solid understanding of algebraic and trigonometric principles, and; ➢ Promote Analytical Thinking: Encourage students to think analytically and critically when approaching mathematical problems, fostering logical reasoning and deductive skills. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Understand Set Theory: Demonstrate understanding of elementary set theory concepts such as subsets, union, intersection, complements, and Venn diagrams, ➢ Apply Real Numbers: Apply knowledge of real numbers, including integers, rational and irrational numbers, mathematical induction, sequences and series, and the theory of quadratic equations, ➢ Manipulate Complex Numbers: Perform operations with complex numbers, including addition, subtraction, multiplication, and division. Understand the geometric representation of complex numbers on the Argand diagram, ➢ Apply Trigonometric Functions: Understand circular measure and apply trigonometric functions to solve problems involving angles of any magnitude. Apply addition and factor formulae to simplify trigonometric expressions, ➢ Utilize Binomial Theorem and De Moivre's Theorem: Apply the binomial theorem to expand binomial expressions and utilize De Moivre's theorem to find powers and roots of complex numbers, By achieving these learning outcomes, students will develop a strong mathematical foundation in algebra and trigonometry, which will prepare them for further studies in mathematics and related fields. They will also acquire problem-solving skills and analytical thinking abilities that are valuable in various academic and professional contexts.	
MTH102	**Elementary/General Mathematics III**	**3 UNITS**
	Functions of Real Variables: Graph, Limits and Concepts of Continuity. Techniques of Differentiation of Algebraic and Trigonometric Functions, Higher Order Derivatives, Maxima and Minimal, Leibnitz Rule, Application of Differentiation. Integration as Inverse of Differentiation, Methods of Integration, Definite Integra.	

	Application to Areas, Volumes, Moment of Inertial. Approximate Integration: Trapezoidal and Simpson's Rule. Taylor's and Mclaurin's Theorems, partial Differentiation and Implicit Differentiation. 45 Hours Lecture **Course Description**: Elementary/General Mathematics II is a continuation of the foundational mathematics sequence, focusing on calculus and its applications. The course covers topics such as functions of a real variable, limits, continuity, derivatives, techniques of differentiation, curve sketching, integration, definite integrals, and their applications to areas and volumes. **Course Aims:** ➢ Calculus Fundamentals: Introduce students to the fundamental concepts of calculus including functions of a real variable, limits, and the idea of continuity. ➢ Derivatives: Teach students about derivatives as limits of rates of change, including techniques of differentiation and their applications. ➢ Extreme Curve Sketching: Enable students to understand extreme values of functions and techniques for curve sketching based on derivatives. ➢ Integration: Introduce integration as the inverse operation of differentiation, along with methods of integration and definite integrals. ➢ Applications of Integration: Explore the applications of integration in calculating areas, volumes, and solving practical problems in various fields. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Understand the fundamental principles of calculus, including functions, limits, and continuity. ➢ Compute derivatives of functions using various differentiation techniques such as the product rule, chain rule, and quotient rule. ➢ Analyze functions to identify extreme values, points of inflection, and sketch accurate graphs based on derivative information. ➢ Perform integration of functions using different methods such as substitution, integration by parts, and partial fractions. ➢ Apply integration techniques to calculate areas bounded by curves and volumes of solids of revolution. ➢ Solve real-world problems involving rates of change, optimization, and areas using differential and integral calculus methods.	

MTH103	**General Mathematics II**	**3 UNITS**
	3-Dimensional Cartesian Coordinate Systems. Definition and Representation of Vectors, Algebra of Vectors, Multiplication of a Vector by a Scalar, Addition of Vectors, Scalar Products of two Vectors, Direction Cosines, Calculus of Vector Functions, Differentiation of Vector Function, Integration of Vector Function. Conic: Circles, Parabola, Ellipse and Hyperbola. 45 Hours Lecture	
MTH104	**Elementary/General Mathematics IV (Basic Algebra)**	**(3 Units)**
	Operations on integers, Rational Numbers, Scientific Notation, Algebraic Equations and Inequalities, Absolute value, polynomials, Rational, Exponential and Logarithm Functions, Conic sections, System and Inequalities, Matrices and Determinants, Solving Linear Equations, Application of Linear Equation in Geometry **Course Description**: Elementary Mathematics IV is designed to provide students with a comprehensive understanding of elementary algebra and trigonometry concepts. The course covers topics such as mappings, bijections, binary operations, relations, trigonometric ratios, graphs of trigonometric functions, solutions of triangles, equations of lines and planes, and applications in 2 and 3 dimensions geometry. **Course Aims**: ➢ Understanding Algebraic Structures: Introduce students to fundamental algebraic structures such as mappings, bijections, binary operations, and their properties including associativity, identity elements, inverse elements, and distributivity. ➢ Exploring Relations: Familiarize students with relations, including the fundamental theorem of equivalence relations, and their applications in various mathematical contexts. ➢ Mastering Trigonometric Concepts: Develop students' proficiency in trigonometric ratios, sums and products formulae, multiple and sub-multiple angles, graphs of trigonometric functions, and inverse circular functions. ➢ Solving Trigonometric Equations and Triangles: Equip students with the skills to solve triangles and trigonometric equations using trigonometric identities and properties.	

	➢ Analyzing Heights and Distances: Provide students with the tools to solve problems involving heights and distances in 2 and 3 dimensions geometry, including the use of trigonometric functions and concepts. ➢ Understanding Equations of Lines and Planes: Introduce students to the equations of lines and planes in 3-dimensional space, and their geometric interpretations. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Demonstrate a thorough understanding of algebraic structures, including mappings, bijections, and binary operations, and their properties. ➢ Apply the concepts of relations and equivalence relations to analyze and solve problems in various mathematical contexts. ➢ Apply trigonometric ratios, formulas, and functions to solve trigonometric equations and problems related to triangles and angles. ➢ Interpret and analyze graphs of trigonometric functions and inverse circular functions. ➢ Solve practical problems involving heights and distances in 2 and 3 dimensions geometry using trigonometric concepts and techniques. ➢ Understand and apply the equations of lines and planes to solve problems in 3-dimensional space, including calculating angles between lines. By achieving these learning outcomes, students will develop a strong foundation in elementary algebra and trigonometry, enabling them to tackle more advanced mathematical concepts and applications in subsequent courses and fields of study.	
PHY101	**Mechanics & Properties of Matter**	**2 UNITS**
	Units and dimensions, scalar and vector, linear and circular motion, velocity acceleration. Laws of mechanics and gravitation, simple applications, conservation of energy, momentum, work, power, simple harmonic motion, simple pendulum. Moment of inertia, angular momentum, centrifugal and centripetal forces, centrifugal elasticity, Hooke's law Young modules, fluid pressure, surface tension, capillary, forces of cohesion and adhesion. Heat: temperature, thermometer, heat transfer, expansion of solids, liquid and gas, gas law, kinetic theory. 30 Hours Lecture	

Course Description:

Mechanics and Properties of Matter is an introductory course that covers fundamental principles in mechanics, thermal physics, and waves. The course explores topics such as space and time, units and dimensions, kinematics, laws of mechanics, statics and dynamics, universal gravitation, work and energy, rotational dynamics, angular momentum, and conservation laws.

Course Aims:

- Understanding Fundamental Principles: Introduce students to fundamental concepts in physics including space and time, units and dimensions, and frames of reference.
- Mechanics: Provide students with a comprehensive understanding of mechanics, covering topics such as kinematics, statics, dynamics, Galilean invariance, universal gravitation, work, energy, rotational dynamics, and conservation laws.
- Thermal Physics: Introduce students to basic principles of thermal physics, including temperature, heat, and the laws of thermodynamics.
- Waves: Familiarize students with the characteristics and properties of waves, including wave motion, wave types, interference, and wave phenomena.

Learning Outcomes:

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

- Understand the concepts of space and time, and apply units and dimensions to solve problems in physics.
- Analyze motion using kinematic equations and understand the fundamental laws of mechanics governing motion.
- Apply principles of statics and dynamics to solve problems involving forces, motion, and equilibrium.
- Understand the principles of universal gravitation and apply them to analyze gravitational interactions between objects.
- Apply the concepts of work, energy, and rotational dynamics to solve problems involving mechanical systems.
- Analyze conservation laws, including the conservation of energy, linear momentum, and angular momentum.
- Understand basic principles of thermal physics, including temperature, heat transfer mechanisms, and the laws of thermodynamics.
- Analyze wave motion, interference, and wave phenomena, and apply wave principles to solve problems in physics.

By achieving these learning outcomes, students will develop a solid foundation in fundamental principles of physics, mechanics, thermal physics, and wave phenomena. They will also acquire problem-solving skills and analytical thinking abilities that are essential for further studies in physics and related disciplines.

PHY102	Electricity & Magnetism I	3 UNITS
	Electrostatics: conductors and currents; dielectric; magnetic fields and induction; Maxwell's equations: electromagnetic wave applications. Waves: sound waves; resonance; reflection and refraction of light at plane and curved surfaces. The human eyes, dispersion, optical instruments. Course Description: General Physics II is a continuation of the introductory physics sequence, focusing on electricity, magnetism, and modern physics. The course covers topics such as electrostatics, conductors and currents, dielectrics, magnetic fields and induction, Maxwell's equations, electromagnetic oscillations and waves, and their applications in various fields. **Course Aims:** ➢ Understanding Electricity and Magnetism: Introduce students to the fundamental principles of electricity and magnetism, including electrostatics, conductors, currents, magnetic fields, and induction. ➢ Dielectrics: Explore the properties and behavior of dielectric materials in electric fields, including polarization and the effects on capacitance. ➢ Maxwell's Equations: Familiarize students with Maxwell's equations, which describe the behavior of electric and magnetic fields and their interrelation. ➢ Electromagnetic Waves: Introduce students to the generation and propagation of electromagnetic waves, including their mathematical description and physical properties. ➢ Applications: Explore practical applications of electromagnetic phenomena in various fields, including telecommunications, electronics, and modern technology. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Understand the principles of electrostatics, including electric charge, electric fields, and Coulomb's law. ➢ Analyze conductors and currents, including Ohm's law, electrical resistance, and circuits. ➢ Understand the behavior of dielectric materials in electric fields, and analyze their effects on capacitance and energy storage. ➢ Analyze magnetic fields and their interactions with currents, including Ampère's law and magnetic induction. ➢ Understand Maxwell's equations and their implications for the behavior of electric and magnetic fields.	

	➢ Describe the generation, propagation, and properties of electromagnetic waves, including their mathematical representation. ➢ Apply principles of electricity and magnetism to solve problems and analyze real-world applications. ➢ Develop critical thinking skills and scientific inquiry methods through laboratory experiments and problem-solving exercises. By achieving these learning outcomes, students will develop a deeper understanding of electricity, magnetism, and electromagnetic waves, and their applications in modern physics and technology. They will also acquire problem-solving skills and analytical thinking abilities that are essential for further studies in physics and related disciplines.	
PHY107	**Practical Physics I**	**1 UNITS**
	Quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques will be employed. The experiments include studies of matters the oscilloscope mechanical systems, electrical and mechanical resonant system, light, heat, and viscosity etc. 15 Hours Lecture **Course Description:** Practical Physics I is an introductory laboratory course designed to complement the theoretical concepts covered in PHY101 and PHY 111. The course focuses on qualitative measurements, treatment of measurement errors, and graphical analysis. Students will engage in a variety of experimental techniques aimed at reinforcing their understanding of fundamental physics principles. **Course Aims:** ➢ Qualitative Measurements: Introduce students to qualitative measurements and observational techniques used in experimental physics. ➢ Treatment of Measurement Errors: Teach students how to identify, analyze, and minimize errors associated with experimental measurements, including systematic and random errors. ➢ Graphical Analysis: Familiarize students with graphical methods for data representation, analysis, and interpretation, including plotting experimental data, curve fitting, and deriving mathematical relationships. ➢ Experimental Techniques: Provide hands-on experience with a variety of experimental techniques, including the use of meters, oscilloscopes, mechanical systems, electrical and mechanical	

	resonant systems, light experiments, heat experiments, and viscosity experiments. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Perform qualitative measurements accurately and effectively using appropriate laboratory instruments and techniques. ➢ Identify and evaluate sources of error in experimental measurements and implement strategies to minimize errors. ➢ Apply graphical methods to analyze and interpret experimental data, including plotting graphs, determining slopes, and extrapolating trends. ➢ Demonstrate proficiency in the use of laboratory equipment such as meters, oscilloscopes, and mechanical apparatuses. ➢ Apply theoretical knowledge gained from PHY101, PHY102, and PHY111 to design and conduct experiments, analyze results, and draw conclusions. ➢ Develop critical thinking and problem-solving skills through hands-on experimentation and data analysis. ➢ Note: Practical Physics I serve as a foundation for more advanced laboratory courses and provides students with essential skills for conducting scientific research and experiments in physics and related fields.	
PHY108	**Practical Physics II** **Course Description:** Practical Physics II is a hands-on laboratory course designed to reinforce theoretical concepts introduced in PHY102, and PHY122. This course emphasizes quantitative measurements, the treatment of measurement errors, and graphical analysis. Students will engage in various experimental techniques to explore topics such as meters, the oscilloscope, mechanical and electrical resonant systems, light, heat, and viscosity. **Course Aims:** ➢ Quantitative Measurements: Enable students to conduct quantitative measurements accurately using appropriate instruments and techniques. ➢ Treatment of Measurement Errors: Familiarize students with techniques for identifying and minimizing measurement errors in experimental setups. ➢ Graphical Analysis: Teach students how to analyze experimental data graphically, including plotting graphs, interpreting results, and drawing conclusions. ➢ Experimental Techniques: Provide students with hands-on experience in conducting experiments related to meters, oscilloscopes, mechanical and electrical resonant systems, light, heat, and viscosity.	**1 Unit**

	➢ Application of Theoretical Concepts: Reinforce theoretical concepts learned in PHY101, PHY102, and PHY103 through practical experimentation. ➢ Laboratory Safety: Promote laboratory safety practices and procedures to ensure a safe working environment for students and instructors. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Perform quantitative measurements accurately using appropriate laboratory instruments and techniques. ➢ Identify sources of measurement errors and implement strategies to minimize their impact on experimental results. ➢ Analyze experimental data graphically, including plotting graphs, interpreting trends, and drawing conclusions based on graphical representations. ➢ Demonstrate proficiency in conducting experiments related to meters, oscilloscopes, mechanical and electrical resonant systems, light, heat, and viscosity. ➢ Apply theoretical concepts learned in PHY101, PHY102, and PHY103 to practical laboratory experiments and observations.	
	Quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques will be employed. The experiments include studies of matters the oscilloscope mechanical systems, electrical and mechanical resonant system, light, heat, and viscosity etc 15 Hours Lecture	
PHY111	**Heat, Sound and Optics**	**2 UNITS**
	Temperature: temperature and the zeroth law of thermodynamics, thermometers and the Celsius temperature scale, thermal expansion, macroscopic description of an ideal gas. The first law of thermodynamics: heat and internal energy, specific heat capacity and latent heat, first law of thermodynamics and applications. The second law of thermodynamics: heat engines, entropy, entropy and the second law of thermodynamics. Sound waves: speed of sound waves. intensity of periodic sound waves, the doppler effect, waves in interference, standing waves. Optics: the nature of light, Huygens principle, total	

	internal reflection, images formation by mirrors and lenses, optical instruments. 30 Hours Lecture **Course Description:** General Physics III is a continuation of the physics sequence, focusing on temperature, zeroth law of thermodynamics, thermometers, the Celsius temperature scale, thermal expansion, macroscopic description of an ideal gas. The first law of thermodynamics, heat and internal energy, specific heat capacity and latent heat. The second law of thermodynamics, heat engines and entropy. Sound waves, speed of sound waves, intensity of periodic sound waves, the Doppler effect, waves in interference, standing waves. Optics: The nature of light, Huygens principle, total internal reflection, image formation by mirrors and lenses, and optical instruments. **Course Aims:** ➢ Heat and Temperature: Introduce students to the concept of heat and temperature of bodies ➢ Thermodynamics: Introduce students to the basic laws and principles of thermodynamics, including temperature, heat, gas laws, and the zeroth law of thermodynamics. ➢ Optic and Sound: Teach students the nature of light, Huygens principle, total internal reflection, image formation by mirrors and lenses, and optical instruments. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Apply the laws of thermodynamics to analyze heat transfer, gas behavior, and temperature changes in physical systems. ➢ Understand the kinetic theory of gases and its applications in explaining gas behavior under different conditions. ➢ Apply mathematical models and equations to thermodynamic principles, and solve problems related to properties of light, sound and optics	
PHY122	**Atomic & Nuclear Physics**	**2 UNITS**
	Theory of atomic structure., Thompson, Rutherford and Bohr's theories, the hydrogen atom, properties of the electron, e/m, CRO, Millikan's experiment, properties of the nucleus, natural radioactivity, wave particle duality of light, x-rays, photo electricity, thermionic emission, diode valve.	

30 Hours Lecture

Course Description:

PHY 122 Atomic & Nuclear Physics is designed to provide students with a comprehensive understanding of the fundamental principles and phenomena governing atomic and nuclear systems. The course covers theoretical models of atomic structure, including the contributions of Thompson, Rutherford, and Bohr, as well as the properties of electrons and the hydrogen atom. Additionally, students will explore topics such as the Cathode Ray Oscilloscope (CRO), Millikan's experiment, properties of the nucleus, radioactivity, x-rays, and photoelectricity diode valves. Through theoretical discussions, experimental demonstrations, and problem-solving exercises, students will gain insights into the nature of matter at the atomic and subatomic levels.

Aim:

The aim of PHY 122 is to provide students with a solid foundation in the principles and applications of atomic and nuclear physics. By studying the theoretical models and experimental evidence underlying atomic and nuclear phenomena, students will develop a deeper understanding of the behavior of matter and radiation at the atomic and subatomic scales. The course aims to foster critical thinking skills and analytical abilities essential for addressing complex scientific questions and solving practical problems in physics and related fields.

Learning Outcomes:

Upon successful completion of PHY 122, students will be able to:

- Explain the theoretical models of atomic structure proposed by Thompson, Rutherford, and Bohr, and evaluate their contributions to our understanding of atomic phenomena.
- Describe the properties of electrons, including their behavior in electric and magnetic fields, and their role in atomic interactions.
- Analyze the structure and properties of the hydrogen atom, including its spectral lines and energy levels.
- Demonstrate an understanding of experimental techniques such as the Cathode Ray Oscilloscope (CRO) and Millikan's experiment, and interpret experimental results in the context of atomic physics.
- Explain the properties of atomic nuclei, including mass, charge, and stability, and describe the phenomena of radioactivity and nuclear decay.
- Discuss the production and properties of x-rays, including their applications in medicine and industry.
- Explain the photoelectric effect and its significance in the development of quantum theory.

	➢ Analyze the operation and applications of diode valves in electronic circuits and devices. ➢ Apply theoretical principles and mathematical techniques to solve problems related to atomic and nuclear physics. ➢ Demonstrate proficiency in experimental techniques, data analysis, and scientific reasoning through laboratory investigations and projects.	
AUO101	**Achievers University Concept I**	**-**
	Achievers University's vision, what led to the vision and the mission. Process of licensing, and ownership of the University. Achievers University's motto and core values. Brief auto-biography of principal owner(s). The University's logo, colours and their meanings. Achievers University from inception to date. Development history of Owo town. God, man, and Achievement. Dress code and code of conduct of an achiever. National Anthem, and pledge; Achievers University's Anthem and pledge. Definition of an achiever, characteristics of an Achiever and requirements for achievement. Achievers University's Honorary Degree Awardees and their auto-biographies. Presidential innovation scholarship scheme and other awards for academic excellence. Examination ethics, grading system, and misconduct. Social vices such as cultism, alcoholism, and drug abuse. Case study of some Achievers: some Nigerians who are acknowledged achievers in their fields, their achievements, and their auto-biographies. **Course Description:** AUO101 Achievers University Concept I provides students with a comprehensive understanding of the vision, mission, and operational processes of Achievers University. The course explores the genesis of the university's vision and mission, including the factors that led to their establishment. Additionally, students will examine the licensing and ownership processes involved in the establishment and operation of the university. Through case studies and discussions, students will also analyze social vices and their impact on the university community and society at large, with a focus on Achievers University. **Aim:** The aim of AUO101 is to familiarize students with the foundational principles, vision, and mission of Achievers University, as well as the regulatory and operational aspects involved in its establishment and	

	governance. By examining social vices and their implications for the university environment, students will develop a deeper understanding of the challenges and opportunities inherent in higher education institutions. **Learning Outcomes:** Upon successful completion of AUO101, students will be able to: ➢ Articulate the vision and mission of Achievers University and explain the significance of these guiding principles in shaping the institution's development and objectives. ➢ Analyze the historical and contextual factors that contributed to the establishment of Achievers University, including the visionaries and stakeholders involved. ➢ Describe the process of licensing and ownership as it pertains to the establishment and governance of Achievers University, including regulatory requirements and compliance measures. ➢ Identify and analyze social vices prevalent in university environments, including their impact on student life, academic performance, and community dynamics. ➢ Utilize case studies and real-life examples to illustrate the challenges and opportunities faced by Achievers University in addressing social vices and fostering a conducive learning environment. ➢ Evaluate the strategies and initiatives implemented by Achievers University to promote student welfare, academic excellence, and ethical conduct within the university community. ➢ Critically assess the role of Achievers University in addressing societal issues and contributing to national development through education and research. ➢ Engage in reflective discussions and debates on the ethical, moral, and social responsibilities of higher education institutions like Achievers University. ➢ Collaborate with peers to develop innovative solutions and initiatives aimed at mitigating social vices and promoting positive campus culture and values. ➢ Demonstrate effective communication skills in articulating ideas, perspectives, and recommendations related to the mission and vision of Achievers University and its role in society.	
AUO102	**Achievers University Concept II**	
	Case study of some Achievers: Some Africans and some other world's acknowledged achievers in their fields, their achievements, and their auto-biographies. Public communication skill. Management skill: principal and application of management. Financial management: Book keeping, basic accounting, and financial discipline. Law Skill:	

	introduction to Nigerian Constitution. Who is a Diplomat? Manners and mannerism of a Diplomat. Dress code and code of conduct for a Diplomat. The AUC courses are unclassified 1 unit courses for only 100 level and Direct Entry students. The courses, which must be registered and passed by the students, are required for them to graduate, though not used like GST courses for computation of their cumulative grade points average (CGPA). **Course Description:** AUO101 Achievers University Concept II provides students with a comprehensive introduction to essential skills and knowledge required for personal and professional development. The course covers topics such as legal skills, an introduction to the Nigerian constitution, dress code conduct, understanding the role of diplomats, public communication skills, and financial management. Through theoretical discussions, practical exercises, and case studies, students will gain insights into the legal framework, communication techniques, and financial principles necessary for success in various aspects of life. **Aim:** The aim of AUO101 is to equip students with a broad understanding of key concepts and skills essential for personal and professional growth. By exploring topics related to law, governance, communication, and financial management, the course aims to empower students with the knowledge and skills necessary to navigate the complexities of modern society, contribute positively to their communities, and achieve their personal and professional goals. **Learning Outcomes:** Upon successful completion of AUO101, students will be able to: ➢ Demonstrate an understanding of basic legal concepts and skills, including legal reasoning, interpretation of laws, and the application of legal principles in practical situations. ➢ Explain the structure and key provisions of the Nigerian constitution, including fundamental rights and principles of governance. ➢ Describe and adhere to appropriate dress code conduct in various social and professional settings, demonstrating awareness of cultural norms and expectations. ➢ Define the role of diplomats in international relations, including their functions, privileges, and responsibilities. ➢ Apply effective public communication skills, including verbal and non-verbal communication techniques, active listening, and persuasive speaking, in personal and professional contexts.	

	➢ Demonstrate proficiency in financial management principles, including budgeting, saving, investing, and debt management, to achieve financial stability and security. ➢ Analyze and evaluate ethical considerations and dilemmas related to law, communication, and financial decision-making. ➢ Utilize critical thinking and problem-solving skills to address legal, communication, and financial challenges encountered in everyday life and professional environments. ➢ Demonstrate professionalism, integrity, and respect for diversity in interpersonal interactions and decision-making processes. ➢ Reflect on personal growth and development in the areas of law, communication, and financial management, and identify areas for continued improvement and learning.	
CEN201	**IT in Engineering**	**2 UNITS**
	Identification of PC parts and peripheral devices: functions, applications, and how to use them. Safety precautions and preventive maintenance of PC. Filing system: directory, sub-directory, file, path, and how to locate them. Word processing: principle of operation, applications, demonstrations, and practical hand-on exercises in word processing using a popular word processing package. Internet: available services, principle of operation, applications, demonstrations, and hand-on exercises in e-mail, and www. Spreadsheet: principle of operation, applications, demonstration, and practical hands-on exercises in use of spreadsheets to solve problems. Database Management package: principle of operation, applications, demonstrations and practical hands-on exercises in use of DBMS package in solving problems. Report Presentation Software Packages: principle of operation, applications, demonstrations, and practical hands-on exercises in use of a popular report presentation package (such as PowerPoint). Mini-project to test proficiency in use of software packages. 30 Hours Lecture **Course Description:** CEN 201 IT in Engineering is designed to provide engineering students with essential knowledge and skills in information technology (IT) applications relevant to engineering practice. The course covers the identification and functions of PC parts and	

	peripheral devices, safety precautions, preventive maintenance of PCs, and the use of various software applications including filing systems, word processing, database management, and spreadsheet software. Through hands-on practical exercises and theoretical discussions, students will learn how to effectively utilize IT tools to enhance productivity and efficiency in engineering tasks. **Aim:** The aim of CEN 201 is to equip engineering students with practical IT skills and knowledge necessary for successful integration of technology into engineering practice. By mastering fundamental concepts and applications of IT, students will be able to leverage technology to streamline engineering processes, improve decision-making, and enhance project outcomes. **Learning Outcomes**: Upon successful completion of CEN 201, students will be able to: ➢ Identify and describe the functions of PC parts and peripheral devices commonly used in engineering applications. ➢ Demonstrate knowledge of safety precautions and best practices for preventive maintenance of PCs to ensure optimal performance and longevity. ➢ Navigate and manage filing systems effectively to organize and retrieve engineering-related files and documents. ➢ Utilize word processing software to create and format engineering reports, technical documents, and correspondence with clarity and precision. ➢ Design and manage databases to store, retrieve, and analyze engineering data efficiently, using appropriate data management techniques and software tools. ➢ Develop and manipulate spreadsheets to perform engineering calculations, analyze data, and create graphical representations of numerical information. ➢ Apply IT skills to solve engineering problems, make informed decisions, and optimize engineering processes and workflows. ➢ Collaborate with peers and stakeholders by effectively communicating engineering information using IT tools and platforms. ➢ Demonstrate proficiency in troubleshooting common IT-related issues encountered in engineering practice and apply appropriate solutions. ➢ Adapt to emerging IT trends and technologies relevant to engineering disciplines, and evaluate their potential impact on engineering practice and innovation.	
CEN202	**Computer Programming and Applications**	**2 UNITS**

	Program design using pseudo-code/flowchart. Extensive examples and exercises in solving engineering problems using pseudo-code/flowchart. Computer programming using structure BASIC such as QBASIC: symbols, keywords, identifiers, data types, operators, statements, flow of control, arrays, and functions. Extensive examples and exercises in solving engineering problems using QBASIC. Use of Visual programming such as Visual BASIC in solving engineering problems. 30 Hours Lecture **Course Description:** CEN 202 introduces students to the principles of computer programming and application development using pseudo-code, flowcharting, and structured BASIC programming language such as QBASIC. The course covers fundamental concepts including symbols, keywords, identifiers, data types, operators, statements, flow control, arrays, and functions. Through extensive examples and exercises, students learn to solve engineering problems using both pseudo-code/flowcharting techniques and actual QBASIC programming. **Aim:** The aim of CEN 202 is to provide students with a solid foundation in computer programming and application development, with a focus on solving engineering problems. Through the course, students will develop proficiency in problem-solving, algorithmic thinking, and programming logic using pseudo-code/flowcharting and the QBASIC programming language. **Learning Outcomes:** Upon successful completion of CEN 202, students will be able to: ➢ Understand and apply the principles of pseudo-code and flowcharting to design algorithms for engineering problems. ➢ Demonstrate proficiency in using QBASIC programming language including symbols, keywords, identifiers, data types, operators, statements, arrays, and functions. ➢ Analyze engineering problems and translate them into structured QBASIC programs. ➢ Apply appropriate flow control structures to implement logical decisions and iterations in QBASIC programs. ➢ Design and implement arrays and functions to organize and modularize QBASIC programs effectively. ➢ Develop problem-solving skills through extensive practice and application of programming concepts to engineering problems.	

	➢ Debug and troubleshoot QBASIC programs to identify and correct errors effectively. Collaborate with peers in problem-solving activities and communicate solutions effectively using programming terminology and techniques.	
BME204	**Engineering Material Science**	**2 UNITS**
	Raw material deposit survey in Nigeria: quantity, location. Processing techniques and existing processed products. Material characteristics and composition. Material re-cycling. Physics of materials. Chemistry of materials. Material sourcing, processing, and entrepreneurship. 30 Hours Lecture **Course Description:** Material Science is a foundational course designed to provide students with a comprehensive understanding of the structure, properties, and behavior of engineering materials. The course covers various aspects of materials, including crystal imperfections, phase diagrams, physical and mechanical properties, as well as electrical, optical, and magnetic properties. Students will also explore the stability of materials in different service environments and learn about the selection criteria for engineering applications. **Course Aims:** ➢ Understanding Material Structure: Introduce students to the structure of matter, including crystal imperfections and phase diagrams of alloys. ➢ Exploring Material Properties: Familiarize students with the physical, mechanical, electrical, optical, and magnetic properties of engineering materials such as wood, cement, plastics, alloys, and ceramics. ➢ Analysis of Mechanical Properties: Analyze mechanical properties such as true stress-strain curves, ultimate strength, ductility, impact strength, hardness, creep, and fatigue failure of materials. ➢ Understanding Electrical Properties: Explore the electrical properties of materials, including conductivity and semi-conductivity. ➢ Studying Stability in Service Environment: Examine the stability of materials in various service environments, including corrosive media, sub-zero, elevated temperatures, and irradiation conditions. ➢ Material Selection Criteria: Provide students with the basic criteria for the selection of materials for engineering applications. ➢ Engineering Properties of Materials: Study the engineering properties of wood, concrete, ceramics, polymers, ferrous and	

	non-ferrous metals and alloys, with a focus on cryogenic, corrosive media, and nuclear applications. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Describe the structure of matter, including crystal imperfections and phase diagrams. ➢ Identify and explain the physical, mechanical, electrical, optical, and magnetic properties of engineering materials. ➢ Analyze mechanical properties such as stress-strain curves, ultimate strength, ductility, and impact strength. ➢ Evaluate the electrical properties of materials, including conductivity and semi-conductivity. ➢ Assess the stability of materials in different service environments, including corrosive media and extreme temperatures. ➢ Apply basic criteria for the selection of materials in engineering applications. ➢ Understand the engineering properties of various materials and their suitability for different applications, including cryogenic, corrosive, and nuclear environments.	
EEE201	**Basic Electrical and Electronics Engineering I**	**2 UNITS**
	Ideal sources and passive components: resistor, switch, voltage sources, current sources, dependent sources and their constitutive relations, power dissipation and power relations. Linear resistive networks and Direct Current (DC) sources: Kirchhoff's Current Law, Kirchhoff's Voltage Law, network topology, equivalent circuits, series and parallel connection of resistance. Linearity and superposition, Thevenin and Norton's equivalent circuits. Loop and node of solving network problems. Transient response of RC, RL and RLC circuits. Introduction to Electronics: Periodic waveforms and their average and effective values. Non-linear elements: their characteristics and uses in simple circuit. Steady state response of single-phase alternating current circuit. 30 Hours Lecture	
EEE202	**Basic Electrical and Electronics Engineering I**	**2 UNITS**

	Review of complex variable. Complex impedances and admittances. Series and parallel resonant circuits. Power factor corrections, magnetic circuit, mutual inductance. Introduction to electrical machines; -AC and DC generators and motors. Introduction to Electrical, Electronic Power measuring instruments and equipment. Introduction to Electronics. Elementary discussion of Semiconductors - PN junction diode, NPN and PNP transistors (BJT, UJT). Full-wave and half-wave rectification circuits and smoothing circuits. Periodic waveforms and their average and effective values. Steady state response of single-phase alternating current circuits. Students are expected to simulate circuits with application software, carry out laboratory works and present mini relevant projects. Includes lectures, demonstrations, and laboratory assignments 30 Hours Lecture **Course Description:** EEE202 provides a foundational understanding of electrical engineering principles and concepts. The course covers fundamental electrical laws, circuit analysis techniques, circuit theorems, and the application of software tools for simulation. Additionally, it explores electrostatics, capacitance, electromagnetism, inductance, and electrochemical power sources. **Course Aims:** ➢ Fundamental Concepts: Introduce students to basic electrical concepts including voltage, current, resistance, and power. ➢ Circuit Laws and Analysis: Teach Ohm's law, Kirchoff's laws, and methods of circuit analysis such as mesh analysis, nodal analysis, and delta/star transformation. ➢ Circuit Theorems: Explain Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer theorem, and reciprocity theorem. ➢ Energy Distribution: Discuss network problems encountered in energy distribution systems. ➢ Software Tools: Familiarize students with software tools like Electronic Workbench, PSpice, MultiSim, and CircuitMaker for simulating electrical circuits. ➢ Electrostatics and Capacitance: Cover electrostatics laws, capacitance, and energy stored in capacitors. ➢ Electromagnetism and Inductance: Explore magnetic fields, inductance, electromagnetic induction, and energy stored in inductors.	

	➢ Electrochemical Power Sources: Introduce the principles of electrochemical power sources. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Apply basic electrical laws and circuit analysis techniques to analyze electrical circuits. ➢ Utilize circuit theorems to simplify complex circuit problems and analyze network behavior. ➢ Employ software tools for simulating electrical circuits and components. ➢ Understand the principles of electrostatics, capacitance, and energy storage in capacitors. ➢ Explain the laws of magnetic force, magnetic fields, and electromagnetic induction. ➢ Analyze inductors in series and parallel configurations and calculate energy stored in inductors. ➢ Describe the operation and characteristics of electrochemical power sources.	
EEE203	**Engineering Mathematics I**	**3 UNITS**
	Limits, Continuity, differentiation, introduction to linear first order differential, equations, partial and total derivatives composite functions, matrices and determinants, Vector algebra, Vector calculus, Directional Derivatives. 45 Hours Lecture **Course Description:** Engineering Mathematics I is designed to provide students with a solid foundation in mathematical techniques and problem-solving skills relevant to engineering applications. The course covers a wide range of topics including equations, functions, sequences, series, calculus, ordinary and partial differential equations, numerical analysis, and linear programming. Emphasis is placed on the application of mathematical concepts to engineering problems, including modeling and simulation. **Course Aims:** ➢ Equations and Functions: Introduce students to various types of equations, including linear, nonlinear, and differential equations, and their applications in engineering problems. ➢ Sequences and Series: Explore the convergence and divergence of sequences and series, and apply tests for convergence to engineering problems.	

	➢ Calculus: Develop students' understanding of elementary differentiation and integration, and their application in solving engineering problems. ➢ Ordinary Differential Equations (ODEs): Provide students with the tools to model engineering systems using first-order ODEs and solve initial-value and boundary-value problems. ➢ Partial Differential Equations (PDEs): Introduce students to simple cases of PDEs and their applications in engineering, particularly in modeling physical phenomena. ➢ Numerical Analysis: Familiarize students with numerical methods such as Euler's method, Runge-Kutta method, and Newton-Raphson method for solving engineering problems involving differential equations. ➢ Linear Programming: Provide an introduction to linear programming and its applications in engineering optimization problems. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Apply mathematical techniques to solve engineering problems involving equations, functions, sequences, and series. ➢ Utilize calculus concepts to analyze and model engineering systems, including differentiation and integration. ➢ Formulate and solve first-order ordinary differential equations to model engineering phenomena. ➢ Understand the basic principles of partial differential equations and their application in engineering modeling. ➢ Apply numerical methods to approximate solutions of engineering problems, including differential equations. ➢ Formulate and solve linear programming problems to optimize engineering systems and processes.	
EEE204	**Measurement and Instrumentation**	**3 UNITS**
	Introduction to Signals and Measuring Systems: Analog and digital signals. Fundamental elements of measurement systems. Static and dynamic characteristics of measurement systems. Modeling of measuring Systems: Random noise (thermal, shot and 1/f noise), interference, errors and accuracy. Mathematical modeling of non-ideal measuring systems. Standards and calibration. Instrument for direct measurement of current, voltage resistance and other circuit parameters: - moving coil, moving coil iron, electrodynamics and electrostatic measuring instrument. Measurement of electrical energy, power factor and frequency. Transducers: Basic requirements of	

transducers, classifications. Sensor principles. Thermocouples, thermistors, platinium100 [PT100], Linear Voltage Differential Transformers (LVDTs), accelerometers, microphones, pressure transducers, photodiodes, strain gauges, Hall effect transducers, flow transducers etc. Instruments for indirect measurement of electrical parameters: - dc and ac bridges.

45 Hours Lecture

Course Description:

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

Course Aims:

- Fundamental Instrumentation Principles: EEE203 aims to introduce students to the principles and techniques of measurement and instrumentation in electrical and electronic systems. The course provides a foundational understanding of various instruments used for measuring DC and AC parameters.
- Instrumentation Techniques: The course aims to familiarize students with basic metering techniques for DC and AC measurements, including rectifier voltmeters, electro-dynamometer wattmeters, and instrument transformers. Students will learn about the operation and applications of DC and AC bridges in measurement systems.
- Electronic Instrumentation: EEE203 aims to explore electronic instruments used for measuring voltage, current, resistance, and other circuit parameters. Students will learn about electronic voltmeters, AC voltmeters using rectifiers, electronic multimeters, and digital voltmeters.
- Oscilloscope Operation: The course aims to provide students with an understanding of oscilloscope operation, including the vertical and horizontal deflection systems, probes, and sampling techniques. Students will learn to generate and analyze waveforms using oscilloscopes.

	➢ Data Acquisition Systems: EEE203 aims to introduce students to analog and digital data acquisition systems. Students will learn about tape recorders, digital-to-analog (D/A) and analog-to-digital (A/D) converters, sample and hold circuits, and their applications in measurement systems. **Learning Outcomes:** Upon completion, students should be able to: ➢ Understand the fundamental principles of measurement and instrumentation in electrical and electronic systems. ➢ Explain the operation and applications of basic meters for DC and AC measurements, including rectifier voltmeters and electro-dynamometer wattmeters. ➢ Analyze the principles and applications of instrument transformers, DC and AC bridges in measurement circuits. ➢ Describe the operation of electronic instruments for measuring voltage, current, resistance, and other circuit parameters. ➢ Use oscilloscopes effectively for waveform generation, visualization, and analysis. ➢ Understand the principles and applications of analog and digital data acquisition systems in measurement and control applications. ➢ Apply measurement and instrumentation techniques to practical electrical and electronic systems, including troubleshooting and calibration procedures.	
EEE206	**Engineering Mathematics II**	**3 UNITS**
	Second order differential equations, line integral, multiple integral and their applications, differentiation of integral. Analytical functions f complex variables. Transformation and mapping, special functions. 45 Hours Lecture **Course Description:** EEE206 Engineering Mathematics is designed to provide students with advanced mathematical tools and techniques essential for solving complex engineering problems. The course covers topics including second-order differential equations, line integrals, multiple integrals, differentiation of integration, analytical functions of complex variables, transformation and mapping, and special functions. Through theoretical discussions, problem-solving exercises, and applications in engineering contexts, students will develop a deep understanding of mathematical concepts and their practical significance in engineering analysis and design.	

	Aim: The aim of EEE206 is to equip students with advanced mathematical skills and knowledge necessary for modeling, analyzing, and solving engineering problems encountered in various disciplines. By exploring mathematical techniques relevant to engineering applications, the course aims to foster critical thinking, problem-solving abilities, and mathematical reasoning essential for success in engineering practice and further academic pursuits. **Learning Outcomes:** Upon successful completion of EEE206, students will be able to: ➢ Solve second-order differential equations arising in engineering problems, including homogeneous and non-homogeneous equations with constant coefficients. ➢ Apply line integrals to evaluate path-dependent integrals in vector fields and understand their significance in electromagnetics, fluid dynamics, and other engineering applications. ➢ Compute multiple integrals over regions in space and apply them to calculate volume, surface area, and other physical quantities relevant to engineering problems. ➢ Differentiate under the integral sign and apply techniques such as partial differentiation and implicit differentiation in engineering contexts. ➢ Analyze functions of complex variables, including real and imaginary parts, analyticity, Cauchy-Riemann equations, and contour integration. ➢ Understand and apply transformation techniques, including conformal mappings, to simplify engineering problems and analyze complex systems. ➢ Solve engineering problems involving special functions such as Bessel functions, Legendre polynomials, and Hermite polynomials, and understand their applications in physics, signal processing, and other fields. ➢ Apply mathematical modeling techniques to formulate engineering problems in mathematical terms, analyze mathematical models, and interpret solutions in engineering contexts. ➢ Use mathematical software tools effectively to visualize, analyze, and solve engineering problems involving advanced mathematical concepts. ➢ Communicate mathematical ideas and solutions effectively, both orally and in writing, to technical and non-technical audiences.	
ESP 223	**Introduction to Entrepreneurship Skills I**	**2 UNITS**
	Introduction to entrepreneurship and new venture creation; Entrepreneurship in theory and practice; The opportunity, forms of	

	business, Staffing, Marketing and the new venture; Determining capital requirements, Raising capital; Financial planning and management; Starting a new business, Feasibility studies; Innovation; Legal Issues; Insurance and environmental considerations. Possible business opportunities in Nigeria. 30 Hours Lecture **Course Description:** Introduction to Entrepreneurship is designed to provide students with a foundational understanding of entrepreneurship, its theories, and its practical applications. The course covers the history and background of entrepreneurship, theories of entrepreneurship, the Nigerian experience in entrepreneurship, and approaches to entrepreneurship. It also explores the entrepreneurial mindset, business opportunities, and includes case analyses and training workshops. **Course Aims:** ➢ Understanding Entrepreneurship: Provide students with an overview of the history, background, and theories of entrepreneurship, including its evolution and significance in economic development. ➢ Entrepreneurship in Nigeria: Explore the Nigerian experience in entrepreneurship, highlighting key trends, challenges, and opportunities in the Nigerian business landscape. ➢ Approaches to Entrepreneurship: Introduce students to different approaches to entrepreneurship, including psychological, sociological, and competency-based perspectives, to develop a holistic understanding of entrepreneurial behavior. ➢ Entrepreneurial Mindset: Help students develop an entrepreneurial mindset characterized by creativity, innovation, risk-taking, and resilience in the face of challenges. ➢ Business Opportunities: Teach students how to identify and evaluate business opportunities by conducting business opportunity profiles, market analysis, and feasibility studies. ➢ Case Analyses: Engage students in the analysis of real-life entrepreneurship cases to understand the practical application of entrepreneurial concepts and principles. ➢ Training Workshops: Provide hands-on training workshops to equip students with practical skills and tools necessary for starting and managing a business venture. **Learning Outcomes:** Upon completion of the course, students will be able to:	

	➢ Understand the historical and theoretical foundations of entrepreneurship and its role in economic development. ➢ Analyze the Nigerian entrepreneurship landscape, including challenges and opportunities for entrepreneurial ventures. ➢ Evaluate different approaches to entrepreneurship and apply relevant theories to real-world scenarios. ➢ Cultivate an entrepreneurial mindset characterized by creativity, adaptability, and opportunity recognition. ➢ Identify and assess business opportunities by conducting market research, feasibility studies, and risk analysis. ➢ Apply problem-solving and decision-making skills in entrepreneurial contexts to address challenges and capitalize on opportunities. ➢ Demonstrate effective communication, teamwork, and leadership skills necessary for entrepreneurial success. Through a combination of theoretical knowledge, practical exercises, case studies, and workshops, students will develop the foundational skills and competencies required to pursue entrepreneurial ventures and contribute to economic growth and innovation.	
GST211	**History and Philosophy of Science**	**2 UNITS**
	A brief survey of the main branches of Philosophy. Symbolic Logic, Special symbols in symbolic Logic-conjunction, negation, affirmation, disjunction, equivalent and conditional statements. Law of tort. The method of deduction using rules of inference and bi- conditionals qualification theory. Types of discourse; Nature or arguments; Validity and soundness; Techniques for evaluating arguments; Distinction between inductive and deductive inferences; etc. (Illustrations will be taken from familiar texts, including literature materials, novels, Law reports and newspaper publications). **Course Description:** GST 211 History and Philosophy of Science offers students an exploration into the historical development and philosophical underpinnings of scientific inquiry. The course provides a brief survey of the main branches of philosophy, including symbolic logic, and examines concepts such as conjunction, negation, affirmation, disjunction, equivalent and conditional statements. Additionally, students will study the law of tort, methods of deduction using rules of inference, biconditionals, types of discourse, nature of arguments, validity and soundness, techniques for evaluating arguments, and laws governing reports and newspapers publication. Through theoretical discussions and practical exercises, students will gain	

	insights into the philosophical foundations of science and the critical analysis of scientific methods and practices. **Aim:** The aim of GST 211 is to provide students with a comprehensive understanding of the history, philosophy, and methodology of science. By examining the philosophical principles underlying scientific inquiry and reasoning, the course aims to cultivate critical thinking skills, logical reasoning abilities, and ethical awareness among students. Additionally, the course aims to foster an appreciation for the role of philosophy in shaping scientific knowledge and discourse. **Learning Outcomes:** Upon successful completion of GST 211, students will be able to: ➢ Demonstrate knowledge of the main branches of philosophy and their relevance to scientific inquiry. ➢ Understand and apply principles of symbolic logic, including conjunction, negation, affirmation, disjunction, equivalent, and conditional statements. ➢ Analyze the law of tort and its implications for scientific research and innovation. ➢ Utilize methods of deduction and rules of inference to evaluate arguments and draw logical conclusions. ➢ Apply biconditionals and qualification theory to construct valid and sound arguments. ➢ Identify different types of discourse and evaluate the nature of arguments presented in scientific literature and discourse. ➢ Evaluate the validity and soundness of arguments using logical reasoning and critical thinking skills. ➢ Apply techniques for evaluating arguments, including identifying logical fallacies and biases. ➢ Understand the laws governing reports and newspapers publication and their implications for scientific communication and ethics. ➢ Critically reflect on the historical development and philosophical foundations of science, recognizing the interplay between science, philosophy, and society. 30 Hours Lecture	
GST 222	**Peace Studies and Conflict Resolution**	**2 UNITS**
	Basic concepts in peace studies and conflict resolution. Peace as vehicle of unity and development, conflict issues, types of conflicts, e.g. ethnic/religious/political/economic conflicts, roots causes of conflicts and violence in Africa, Indigene/settler phenomenon, peace building management of conflict and security.	

30 Hours Lecture

Course Description:
GST 222 Peace Studies and Conflict Resolution is designed to provide students with a comprehensive understanding of the concepts, theories, and practices related to peace, conflict, and conflict resolution. The course explores the root causes of conflicts, various approaches to conflict resolution, and the role of peace education in fostering peaceful coexistence. Additionally, it examines the impact of environmental factors, human rights issues, and gender-related conflicts on development and peace-building efforts in Africa.

Course Aims:
- Understanding Peace and Conflict: Provide students with a foundational understanding of the definitions and dynamics of peace and conflict, including their manifestations in society.
- Conflict Analysis and Resolution: Introduce students to theories and methodologies for analyzing conflicts and implementing effective conflict resolution strategies.
- Peace Education and Mediation: Familiarize students with the principles and practices of peace education, conflict transformation, and mediation processes as means of resolving disputes and fostering reconciliation.
- Environmental Factors and Human Rights: Examine the role of environmental degradation, human rights violations, and gender-related conflicts in exacerbating tensions and hindering sustainable development and peace-building efforts.
- Theories in Peace Studies: Explore various theoretical frameworks in peace studies to understand the complexities of ethnic, religious, and socio-political conflicts in Africa and their implications for peace and stability.

Learning Outcomes:
Upon completion of the course, students will be able to:
- Define and differentiate between peace and conflict, and analyze the root causes and dynamics of conflicts in society.
- Apply conflict analysis tools and methodologies to identify underlying issues and stakeholders involved in conflicts.
- Evaluate various approaches to conflict resolution, including negotiation, mediation, arbitration, and reconciliation processes.
- Understand the role of peace education in promoting tolerance, diversity, and understanding among diverse communities.
- Analyze the impact of environmental degradation, human rights violations, and gender-related conflicts on development and peace-building efforts.

	➢ Critically assess theories in peace studies to explain the complexities of ethnic, religious, and political conflicts in Africa and their implications for peace and stability.	
MEE201	**Engineering Drawing I**	**2 UNITS**
	Lettering, Dimensioning, Orthographic projection, auxiliary and sectional Views, True lengths, Graphical calculus, Architectural Drawings. Advanced topics in auxiliary and sectional views, development, Intersection of surfaces, Isometric projection; dimensioning and Tolerances; Blue – print reading. 30 Hours Lecture **Course Description:** Engineering Drawing I is a foundational course that introduces students to the principles and techniques of technical drawing in engineering design and communication. The course covers the use of drafting instruments, lettering, dimensioning, and layout. Students learn graphical representation methods for geometric figures, machine drawings, assembly drawings, and working drawings. The course also explores pictorial representation, freehand sketching, graphical calculus, projections, and principles of tangency. Additionally, students are introduced to Computer-Aided Drafting (CAD) software and electronic drafting packages used in modern engineering design. **Course Aims:** ➢ Introduction to Draughting Instruments: Familiarize students with the proper use of draughting instruments and tools for technical drawing. ➢ Lettering and Dimensioning: Teach students the techniques of lettering and dimensioning in engineering drawings for clarity and precision. ➢ Engineering Graphics: Introduce students to graphical representation methods for geometric figures, machine drawings, and assembly drawings. ➢ Pictorial Representation and Freehand Sketching: Develop students' skills in creating pictorial representations and freehand sketches of engineering components and systems. ➢ Graphical Calculus and Applications Development: Explore graphical calculus methods and their applications in engineering design and analysis. ➢ Projections and Orthographic Projection: Teach students the principles of projections, including lines, planes, simple solids, and orthographic projection techniques.	

	➢ Auxiliary Views and Sectioning: Introduce students to auxiliary views and sectioning methods used to represent complex engineering components. ➢ Introduction to Computer-Aided Drafting (CAD): Familiarize students with CAD software and electronic drafting packages commonly used in engineering design and drafting. ➢ Simulation Packages: Provide an overview of simulation packages used in engineering design for modeling and analysis. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Use draughting instruments effectively to produce accurate technical drawings. ➢ Apply lettering and dimensioning techniques to engineering drawings according to industry standards. ➢ Create graphical representations of geometric figures, machine drawings, and assembly drawings. ➢ Generate pictorial representations and freehand sketches of engineering components. ➢ Apply graphical calculus methods to solve engineering design problems. ➢ Generate projections and orthographic projections of lines, planes, and solids. ➢ Create auxiliary views and sectioning drawings to represent complex engineering components accurately. ➢ Utilize Computer-Aided Drafting (CAD) software and electronic drafting packages for engineering design tasks. ➢ Understand the principles and applications of simulation packages in engineering design and analysis.	
MEE202	**Engineering Drawing II**	**2 UNITS**
	Further projection of solids. First and third angle projections. Isometric projections. Intersection of surfaces and developments. Sectional views, Curve of interpenetrations. True lengths and true shapes. Parts and assembly drawings. Preparation of working drawing for manufacturing in accordance with standards. Reading and interpretation of manufacturer's drawing of equipment. 30 Hours Lecture **Course Description:** MEE 202 Engineering Drawing II is a continuation of the introductory course in engineering drawing, focusing on more advanced topics and applications. The course covers auxiliary projections, mechanical drawings of machine parts including cams, gears, couplings, bearings, pipes, joints, and valves. It also delves into	

	structural drawing, material representation, dimensioning of structural details and welds, and the detailing of wood and concrete structures. Additionally, the course provides an introduction to computer-aided design and computer-aided manufacturing (CAD/CAM), exploring their applications and functionality. **Course Aims**: ➢ Advanced Mechanical Drawings: Provide students with the skills to create detailed mechanical drawings of machine parts used in various engineering applications. ➢ Structural Drawing: Familiarize students with the principles of structural drawing, including material representation, dimensioning, and detailing of structural elements. ➢ Introduction to CAD/CAM: Introduce students to computer-aided design and manufacturing technologies, their applications, and the operation of CAD software, particularly AutoCAD. ➢ Hands-on Practice: Provide students with practical experience in CAD application through hands-on exercises and projects. **Learning Outcomes**: Upon completion of the course, students will be able to: ➢ Create auxiliary projections to represent objects from different viewpoints. ➢ Produce detailed mechanical drawings of machine parts such as cams, gears, couplings, bearings, and valves. ➢ Generate structural drawings with accurate material representation, dimensioning, and detailing of structural elements including wood and concrete structures. ➢ Utilize CAD/CAM software, particularly AutoCAD, to create and modify engineering drawings and designs. ➢ Apply CAD/CAM technology to solve real-world engineering problems and improve design efficiency.	
MTE203	**Engineers-in-Society**	**1 UNIT**
	Philosophy of Science and Engineering. History of Engineering and Technology, The Engineering profession- engineering literacy professional bodies and engineering societies. Engineers' code of conduct and ethics. Engineers and nation building – economy, politics, business, safety in Engineering and introduction in risk analysis, invited lecturers from professionals 15 Hours Lecture **Course Description:** Engineer in Society is a foundational course that explores the role of engineers within the context of society, history, ethics, and	

	professional practice. The course introduces students to the philosophy of science, the history of engineering and technology, safety considerations, risk analysis, and the ethical responsibilities of engineers. Through lectures, discussions, and guest speakers, students will gain insights into the societal impact of engineering and the professional obligations of engineers. **Course Aims:** ➢ Philosophy of Science: Introduce students to the philosophical foundations of science and its implications for engineering practice. ➢ History of Engineering and Technology: Provide an overview of the historical development of engineering and technological advancements, emphasizing the contributions of engineers to societal progress. ➢ Professional Skills and Requirements: Familiarize students with the basic skills, requirements, and career development opportunities in engineering professions. ➢ Safety and Risk Analysis: Introduce students to safety considerations in engineering practice and the fundamentals of risk analysis in engineering projects. ➢ Engineer's Role in Nation Building: Explore the role of engineers in nation-building initiatives, including the development of infrastructure, technology, and sustainable solutions for societal challenges. ➢ Engineering Ethics and Conduct: Discuss the ethical responsibilities of engineers, including adherence to professional codes of practice, design specifications, and standards. ➢ Public Interest and Professionalism: Examine the engineer's responsibility to serve the public interest and uphold professional standards of conduct and integrity. ➢ Guest Lectures from Professionals: Provide opportunities for students to engage with industry professionals through guest lectures and presentations, gaining insights into real-world engineering practice. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Demonstrate an understanding of the philosophical foundations of science and its relevance to engineering. ➢ Identify key milestones and developments in the history of engineering and technology. ➢ Describe the professional skills, requirements, and career pathways available to engineers. ➢ Apply principles of safety and risk analysis to engineering projects and decision-making processes. ➢ Assess the role of engineers in nation-building initiatives and sustainable development.	

	➢ Analyze ethical dilemmas and apply ethical frameworks to engineering practice. ➢ Understand the importance of public interest, professionalism, and adherence to professional codes of conduct in engineering. ➢ Engage with industry professionals and gain insights into contemporary engineering practice through guest lectures and presentations.	
MEE204	**Fundamental of Thermodynamics**	**3 UNITS**
	Basic concepts, energy and energy conversions and surroundings, temperature of scales, quantitative relations of zeroth, first, second and third laws of thermodynamics. Steady flow energy equations. Heat and work. Behaviour of pure substances and perfect gases. Applications of the first law. Use of steam tables and charts 45 Hours Lecture **Course Description:** Thermodynamics I is an introductory course that delves into the fundamental principles governing the behavior of energy and heat transfer in engineering systems. It covers essential concepts such as energy conversion, temperature scales, laws of thermodynamics, heat cycles, ideal gases, and steady-state flow equations. Students learn to apply these principles to analyze and solve problems related to energy conversion processes and heat transfer in engineering systems. **Course Aims:** ➢ Basic Concepts of Thermodynamics: Introduce students to the fundamental principles and concepts of thermodynamics, including energy, temperature scales, and surroundings. ➢ Laws of Thermodynamics: Provide an overview of the zeroth, first, second, and third laws of thermodynamics, along with their quantitative relations and applications. ➢ First Law of Thermodynamics: Explore the application of the first law of thermodynamics to open and closed systems, focusing on energy conservation and work transfer. ➢ Second Law of Thermodynamics: Discuss the second law of thermodynamics and its implications for heat transfer and energy conversion processes. Study heat cycles and their practical applications. ➢ Steady-State Flow Equations: Introduce the steady-state flow equation, including Bernoulli's equation, and its applications in fluid mechanics and thermodynamics. ➢ Ideal Gas Behavior: Examine the properties and behavior of ideal gases under various conditions, including temperature, pressure, and volume changes.	

	➢ Heat and Work: Discuss the concepts of heat and work in thermodynamic systems, including their definitions, calculations, and applications. ➢ Use of Steam Tables and Charts: Familiarize students with the use of steam tables and charts for thermodynamic calculations and analysis of steam properties. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Understand the basic principles and concepts of thermodynamics. ➢ Apply the laws of thermodynamics to analyze energy transfer and conversion processes. ➢ Calculate energy changes and work transfer in open and closed thermodynamic systems. ➢ Analyze heat cycles and apply the second law of thermodynamics to real-world systems. ➢ Solve problems involving steady-state flow equations, including Bernoulli's equation. ➢ Describe the behavior of ideal gases and apply gas laws to thermodynamic processes. ➢ Calculate heat and work interactions in thermodynamic systems using appropriate equations and principles. ➢ Utilize steam tables and charts to analyze properties and perform calculations related to steam.	
MEE206	**Mechanics of Machine I**	**3 UNITS**
	Forces, moments, couples. Equilibrium of simple structures and machines parts. Friction. First and second moments of area; centroids. Kinematics of particles and rigid bodies in plane motion. Newton's Kinetic energy and momentum analyses. Hooke's law; stresses and due to loading and temperature changes. Torsion. The stress circle, deflection of beams with symmetrical and combined loadings. Elastic buckling of columns, shear forces and bending moments, analytical and graphical methods for structures. 45 Hours Lecture **Course Description:** Thermodynamics I is an introductory course that delves into the fundamental principles governing the behavior of energy and heat transfer in engineering systems. It covers essential concepts such as energy conversion, temperature scales, laws of thermodynamics, heat cycles, ideal gases, and steady-state flow equations. Students learn to	

apply these principles to analyze and solve problems related to energy conversion processes and heat transfer in engineering systems.

Course Aims:

- Basic Concepts of Thermodynamics: Introduce students to the fundamental principles and concepts of thermodynamics, including energy, temperature scales, and surroundings.
- Laws of Thermodynamics: Provide an overview of the zeroth, first, second, and third laws of thermodynamics, along with their quantitative relations and applications.
- First Law of Thermodynamics: Explore the application of the first law of thermodynamics to open and closed systems, focusing on energy conservation and work transfer.
- Second Law of Thermodynamics: Discuss the second law of thermodynamics and its implications for heat transfer and energy conversion processes. Study heat cycles and their practical applications.
- Steady-State Flow Equations: Introduce the steady-state flow equation, including Bernoulli's equation, and its applications in fluid mechanics and thermodynamics.
- Ideal Gas Behavior: Examine the properties and behavior of ideal gases under various conditions, including temperature, pressure, and volume changes.
- Heat and Work: Discuss the concepts of heat and work in thermodynamic systems, including their definitions, calculations, and applications.
- Use of Steam Tables and Charts: Familiarize students with the use of steam tables and charts for thermodynamic calculations and analysis of steam properties.

Learning Outcomes:

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

- Understand the basic principles and concepts of thermodynamics.
- Apply the laws of thermodynamics to analyze energy transfer and conversion processes.
- Calculate energy changes and work transfer in open and closed thermodynamic systems.
- Analyze heat cycles and apply the second law of thermodynamics to real-world systems.
- Solve problems involving steady-state flow equations, including Bernoulli's equation.
- Describe the behavior of ideal gases and apply gas laws to thermodynamic processes.
- Calculate heat and work interactions in thermodynamic systems using appropriate equations and principles.
- Utilize steam tables and charts to analyze properties and perform calculations related to steam.

MEE203	**Engineering Workshop Practice**	**1 UNITS**
	Introduction to engineering workshop practice covering Mechanical, Electrical, Information engineering, Civil, Chemical, Petroleum engineering and other relevant engineering workshops. Machine operation practice. Use of hand tools, and safety measures in these fields. 15 Hours Lecture; 45 Hours Practical **Course Description:** Workshop Practice is a practical course designed to provide students with hands-on experience in various workshop processes and techniques related to metalworking and production engineering. The course covers metal cutting, metal joining, casting techniques, heat treatment, rolling processes, drawing, and deep drawing. Additionally, students will learn about the economics of production processes and practice machine operations using hand tools while adhering to safety measures. **Course Aims:** ➢ Metalworking Techniques: Introduce students to various metalworking techniques including metal cutting, metal joining, and casting processes. ➢ Heat Treatment and Rolling Processes: Provide students with an understanding of heat treatment methods and principles of rolling, including hot and cold rolling processes. ➢ Casting Techniques: Familiarize students with different casting techniques such as sand molding, centrifugal casting, die casting, and investment casting. ➢ Drawing and Deep Drawing: Teach students the principles and techniques of drawing and deep drawing metal components. ➢ Economics of Production Processes: Introduce students to the economic aspects of production processes and their implications for manufacturing efficiency and cost-effectiveness. ➢ Machine Operation Practice: Allow students to practice machine operations using hand tools and other workshop equipment while emphasizing safety precautions. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Demonstrate proficiency in various metalworking techniques including metal cutting, joining, and casting.	

	➢ Understand the principles of heat treatment and its applications in modifying material properties. ➢ Identify different casting techniques and their respective advantages and limitations. ➢ Apply drawing and deep drawing techniques to create metal components with specific shapes and dimensions. ➢ Analyze the economic aspects of production processes and make informed decisions regarding manufacturing methods and efficiency. ➢ Safely operate workshop machinery and hand tools while adhering to established safety protocols and guidelines.	
CVE201	**Strength of Material 1**	**2 UNITS**
	Force equilibrium – free body diagrams. Concept of stress; Tensile test. Young's modulus and other strength factors. Axially loaded bars, composite bars, temperature stresses and simple indeterminate problems. Hoop stresses in cylinders and rings. Bending moment, shear force and axial force diagrams for simple cases, Simple torsion and application. 30 Hours Lecture **Course Description:** CVE201 is a comprehensive study of the behavior of materials under various types of loading conditions. The course covers fundamental concepts such as stress, strain, and deformation, as well as advanced topics including bending, torsion, and failure theories. Students will learn to analyze and design structural elements subjected to axial, bending, and torsional loads, considering factors such as stress concentration, fatigue, and material properties. **Course Aims:** ➢ Fundamental Concepts: Introduce students to the concepts of stress, strain, and deformation in materials under various loading conditions. ➢ Mechanical Properties: Understand the mechanical properties of materials, including modulus of elasticity, yield strength, and ultimate strength. ➢ Analysis Techniques: Equip students with analytical techniques to determine stresses, strains, and deformations in structural elements. ➢ Bending and Torsion: Explore the theory of bending and torsion in beams, including calculation of bending moments, shear forces, and deflections.	

	➢ Failure Theories: Introduce different failure theories and their applications in predicting material failure under different loading conditions. ➢ Design Considerations: Provide guidelines for the design of beams, shafts, columns, and other structural components to ensure adequate strength and safety. ➢ Advanced Topics: Cover advanced topics such as stress concentration, fatigue, fracture mechanics, and the theory of elasticity. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Understand the behavior of materials under different types of loading conditions. ➢ Calculate stresses, strains, and deformations in structural elements subjected to axial, bending, and torsional loads. ➢ Analyze and design beams, shafts, and columns for strength and safety considerations. ➢ Apply failure theories to predict material failure under various loading scenarios. ➢ Evaluate the effects of stress concentration, fatigue, and fracture on structural integrity. ➢ Interpret bending moment, shear force, and axial force diagrams for simple and complex loading cases. ➢ Demonstrate knowledge of advanced topics such as elastic deformation, plasticity, and limit analysis.	
MTE 211	**Fundamental of Fluid Mechanics**	**2 UNITS**
	Properties of fluids, Fluids statics, Basic conservation laws, friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamic similitude, principles of construction and operation of selected hydraulic machinery. Hydropower systems. 30 Hours Lecture **Course Description:** Fundamentals of Fluid Mechanics is an introductory course that explores the fundamental principles governing the behavior of fluids in various engineering applications. The course covers properties of fluids including density, pressure, surface tension, viscosity, and compressibility. It delves into fluid statics, buoyancy of floating bodies, fluid dynamics, and the basic conservation laws governing fluid flow. Additionally, the course addresses friction effects and	

	losses in laminar and turbulent flows in ducts and pipes, as well as dimensional analysis and dynamic similitude. **Course Aims:** ➢ Understanding Fluid Properties: Introduce students to the properties of fluids and their significance in engineering applications. ➢ Fluid Statics: Explore the principles of fluid statics and buoyancy to analyze equilibrium conditions of fluids at rest. ➢ Fluid Dynamics: Examine the principles governing fluid motion and the conservation laws applied to fluid flow. ➢ Friction Effects and Losses: Analyze friction effects and losses in both laminar and turbulent flows in ducts and pipes. ➢ Dimensional Analysis: Introduce students to dimensional analysis and dynamic similitude to study fluid behavior and scaling laws. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Define and explain the properties of fluids including density, pressure, viscosity, and surface tension. ➢ Analyze the equilibrium of fluids at rest and calculate buoyant forces on floating bodies. ➢ Apply conservation laws to analyze fluid flow dynamics and solve related problems. ➢ Evaluate friction effects and losses in laminar and turbulent flows in ducts and pipes. ➢ Perform dimensional analysis and apply dynamic similitude to study fluid behavior and scale-up engineering models.	
MEE205	**Manufacturing Technology 1**	**3 UNITS**
	Basic manufacturing industries and process including casting, forging, assembling, inspection/testing and certification, packaging, warehousing and forwarding. Metal working operations: shaping, planning, milling, drilling, turning, reaming, broaching, abrasive machining and chipless machining processes. Metal cutting tools and cutting fluids, cutting forces and power. Threads, gears, selection of materials, processing methods and equipment for manufacturing. Fabrication methods including welding, soldering, brazing, adhesive bonding and mechanical fastening. Quality control in manufacturing**.** 45 Hours Lecture	

Course Description:
MEE 205 Manufacturing Technology 1 provides students with a comprehensive overview of fundamental manufacturing processes and techniques essential for modern industrial production. The course covers various aspects of manufacturing industries and processes, including casting, forging, assembling, inspection/testing, certification, packaging, warehousing, and forwarding. Additionally, students will explore metalworking operations such as shaping, planning, milling, drilling, turning, reaming, broaching, abrasive machining, and chipless machining processes. The course also delves into fabrication methods, including welding, soldering, brazing, adhesive bonding, and mechanical fastening, as well as quality control measures in manufacturing.

Aim:
The aim of MEE 205 is to equip students with a comprehensive understanding of manufacturing technologies and processes used in modern industrial settings. By exploring a wide range of manufacturing methods and techniques, the course aims to prepare students for careers in manufacturing engineering, production management, quality control, and related fields. Through theoretical instruction, practical demonstrations, and hands-on experience, students will develop the skills and knowledge necessary to contribute effectively to manufacturing operations and processes.

Learning Outcomes:
Upon successful completion of MEE 205, students will be able to:

- Identify and describe various manufacturing industries and processes, including casting, forging, assembling, and inspection/testing, and certification, packaging, warehousing, and forwarding.
- Demonstrate proficiency in metalworking operations such as shaping, planning, milling, drilling, turning, reaming, broaching, abrasive machining, and chipless machining processes.
- Explain the selection and use of metal cutting tools, cutting fluids, and the determination of cutting forces and power requirements in manufacturing operations.
- Describe and apply fabrication methods including welding, soldering, brazing, adhesive bonding, and mechanical fastening, to join materials effectively.
- Evaluate and implement quality control measures in manufacturing, including statistical process control, inspection techniques, and documentation procedures.
- Interpret engineering drawings, specifications, and technical documents related to manufacturing processes and products.
- Demonstrate safe working practices and adherence to relevant industry standards and regulations in manufacturing environments.

	➢ Analyze and troubleshoot manufacturing processes and equipment to optimize efficiency, productivity, and product quality. ➢ Collaborate effectively with team members and stakeholders to achieve manufacturing goals and objectives. ➢ Apply critical thinking and problem-solving skills to address challenges and opportunities in manufacturing operations and processes.	
EEE 220	**Students Work Experience Programme (SWEP)** ENG200 Students Work Experience Programme I provides students with the opportunity to gain practical work experience in an industrial setting relevant to their field of study. The course is designed to complement theoretical learning with hands-on experience, allowing students to apply classroom knowledge to real-world work environments. Under the supervision of faculty members, students will engage in various tasks and projects within industrial settings, contributing to their professional development and enhancing their understanding of industry practices. **Course Objectives:** Practical Application: Provide students with the opportunity to apply theoretical knowledge gained in their academic studies to practical work settings. Professional Development: Enhance students' professional skills, including communication, problem-solving, teamwork, and time management, through hands-on work experience. Industry Exposure: Expose students to the day-to-day operations, processes, and challenges faced by professionals in their field of study. Networking Opportunities: Facilitate networking and relationship-building opportunities between students, faculty members, and industry professionals. Skill Assessment: Enable faculty members to assess students' practical skills, work ethic, and overall performance in an industrial setting. Course Requirements: Students enrolled will be required to: Secure a placement in an industrial setting relevant to their field of study. Complete a specified number of hours of work experience as determined by the course guidelines. Participate in tasks, projects, and assignments assigned by the supervising faculty member and industry mentor. Maintain regular communication with the supervising faculty member to discuss progress, challenges, and learning objectives.	**6** **UNITS**

	Adhere to the policies, procedures, and safety protocols of the host organization. Assessment: Assessment of students' work experience will be based on: Completion of assigned tasks and projects within the industrial setting. Quality of work performed and adherence to industry standards. Professionalism, punctuality, and work ethic demonstrated throughout the placement. Ability to effectively apply theoretical knowledge to practical work scenarios. Feedback and evaluation provided by the supervising faculty member and industry mentor. Conclusion: Students Work Experience Programme I offers students a valuable opportunity to gain practical insights into their chosen field and develop essential professional skills necessary for success in the workplace. By actively participating in industrial work placements under the guidance of faculty members, students can bridge the gap between academic theory and real-world application, preparing them for future career opportunities and challenges. Through meaningful work experiences and mentorship, students can make informed career decisions, build professional networks, and lay the foundation for a successful and fulfilling career journey.	
	Introduction to practices and skills in general engineering through instruction in operation of hand and powered tools for wood and metal cutting and fabrication. Supervised hands – on experience in safe usage of tools and machines for selected tasks.	
CEN301	**Computer Software Engineering Laboratory**	**2UNITS**
	Practical in-depth use of software packages such as Auto-CAD, MATLAB, Simulation packages, etc. 30 Hours Lecture **Course Description:** CEN 301 Computer Software Engineering Laboratory offers practical, hands-on experience in utilizing various software packages relevant to computer software engineering. The course emphasizes the application of software tools such as AUTOCAD, MATLAB, and simulation packages to solve real-world engineering problems. Through structured laboratory sessions, students will gain proficiency in software usage, problem-solving techniques, and software engineering practices.	

	Aim: The aim of CEN 301 Computer Software Engineering Laboratory is to provide students with practical exposure to key software packages commonly used in computer software engineering. The course aims to develop students' proficiency in software utilization, problem-solving, and engineering design through hands-on laboratory exercises. **Learning Outcomes:** Upon successful completion of the course, students will be able to: ➢ Utilize AUTOCAD: Students will demonstrate proficiency in using AUTOCAD for engineering design, drafting, and visualization tasks. They will be able to create 2D and 3D models, annotate drawings, and apply advanced features for architectural and engineering applications. ➢ Apply MATLAB: Students will be able to effectively use MATLAB for numerical computation, data analysis, algorithm development, and simulation tasks. They will gain proficiency in programming MATLAB scripts and functions to solve engineering problems, analyze data, and visualize results. ➢ Employ Simulation Packages: Students will learn to use simulation packages to model and simulate dynamic systems, analyze system behavior, and evaluate performance metrics. They will develop skills in constructing simulation models, conducting experiments, and interpreting simulation results to address engineering challenges. ➢ Integrate Software Tools: Students will learn to integrate multiple software tools to tackle complex engineering problems. They will develop the ability to leverage the strengths of different software packages in an integrated environment to enhance productivity and solve interdisciplinary engineering problems. ➢ Apply Software Engineering Practices: Students will understand the importance of software engineering principles and practices in developing reliable and maintainable software solutions. They will learn to apply software engineering methodologies, such as version control, documentation, and testing, to ensure the quality and reliability of software artifacts developed during laboratory exercises.	
CEN302	**Technical Report and Communication**	**2UNITS**
	Professional use of English Language for letters, specification descriptions, presentation of charts, graphs, tables, writing of proposals in reports. Case studies of major professional presentation of reports and proposals.	

	30 Hours Lecture **Course Description:** CEN 302 Technical Report and Communication focuses on developing students' proficiency in professional English language usage for various technical communication purposes. Students will learn the principles and practices of effective communication in the context of technical reports, proposals, letters, specification descriptions, and presentations of data using charts, graphs, and tables. The course integrates case studies to illustrate major professional presentations of reports and proposals, offering real-world examples to enhance learning. **Aim:** The aim of CEN 302 Technical Report and Communication is to equip students with the necessary skills and knowledge to communicate effectively in professional settings, particularly within technical fields. Through comprehensive instruction and practical exercises, students will learn to craft clear, concise, and compelling technical documents and presentations that meet industry standards and expectations. **Learning Outcomes:** Upon successful completion of the course, students will be able to: ➢ Demonstrate proficiency in using professional English language for technical communication purposes, including letters, specification descriptions, and proposals. ➢ Analyze and interpret data effectively and present it visually using appropriate charts, graphs, and tables. ➢ Develop well-structured technical reports and proposals that address specific audiences and objectives. ➢ Apply critical thinking skills to evaluate and revise technical documents for clarity, coherence, and conciseness. ➢ Utilize case studies of major professional presentations to enhance understanding of best practices in technical communication. ➢ Collaborate effectively in teams to create and deliver professional presentations and reports. ➢ Adapt communication strategies to different contexts and audiences within the technical domain. ➢ Demonstrate awareness of ethical considerations in technical communication, including issues of accuracy, honesty, and intellectual property rights.	
EEE 301	**Computer Network and Data Communication** **Course Description**: EEE 301 introduces students to the fundamentals of computer networks and data communication. The course covers the development of data communication, various types and sources of	**2UNITS**

	data, network protocols, error control mechanisms, data compression techniques, and an overview of local area networks (LANs), the Internet, and Ethernet technology. Emphasis is placed on understanding the OSI (Open Systems Interconnection) model and its seven layers, as well as practical applications of networking concepts. **Aim:** The aim of this course is to provide students with a comprehensive understanding of computer networks and data communication principles, protocols, and technologies. Students will learn the theoretical foundations and practical aspects necessary for designing, implementing, and managing computer networks effectively. **Learning Outcomes:** Upon successful completion of the course, students will be able to: ➢ Understand the development and evolution of data communication, including the types and sources of data transmitted over networks. ➢ Explain the structure and functionality of the OSI model and its seven layers, and analyze how different protocols operate within each layer. ➢ Demonstrate proficiency in error control mechanisms, including forward error control and error detection methods such as parity checking. ➢ Evaluate data compression techniques and their applications in reducing bandwidth usage and optimizing network performance. ➢ Describe the characteristics and components of local area networks (LANs), the Internet, and Ethernet technology. ➢ Apply networking concepts to design, configure, and troubleshoot basic network architectures. ➢ Analyze real-world networking scenarios and propose appropriate solutions based on theoretical knowledge and practical understanding. ➢ Collaborate effectively in group projects and communicate technical concepts clearly and concisely.	
EEE302	**Electromechanical Devices and Machines II**	**2 UNITS**
	Introduction to data communication: the development of data communications; types and sources of data, simple communications network, transmission definitions, one way transmission, half duplex transmission, transmission codes, transmission modes, parallel transmission, serial transmission, bit synchronization, character	

	synchronization, synchronous transmission, asynchronous transmission, efficiency of transmission, error detection methods and data compression. Protocol: Introduction to network protocol. Seven-Layer ISO-OSI standard protocols and network architecture. Transport protocol, session services protocol, and other protocols. Institute of Electrical and Electronics Engineering 802 standards. Error control and Data Compression: Forward Error Control; error detection methods; parity checking; linear block codes, cyclic redundancy checking; feedback error control, data compression, Huffman coding and dynamic Huffman coding. Local Area Networks: medium access control techniques – Ethernet, token bus and token ring; LAN standards; fibre distributed data interface, metropolitan area network. Peer-to-peer, Client Server, Client-Server Requirements: GUI design standards, interface independence, platform independence, transaction processing, connectivity, reliability, backup and recovery mechanisms. Information Network Software; Features and benefits of major recovery mechanisms. Information Network Software: features and benefits of major Network Operating Systems. Network OS: (e.g. Novell NetWare, UNIX/LINUX, OS/2 & WindowsNT). TCP/IP and Network OS. INTERNET: Definition, architecture, services, Internet, Intranet. System administration, and security issues. **Course Description:** Induction machines, wound rotor, squirrel cage rotor constructions and characteristics, circuit diagram of induction motors. Torque/slip characteristics, circle diagram, method of performance prediction. Losses, power flow and efficiency of induction motors. Speed control of induction motors. Protection of induction machines, method of starting induction machines, fractional horse-power motors, single-phase induction motors, universal motors. Reluctance motors, hysteresis motors.and industrial applications of induction machines. Performance of synchronous machines, rotating magnetic fields, emf equation, 3-phase alternators, winding factors, equivalent circuits, phasor diagram for cylindrical rotor. Steady-state performance, characteristic features of salient synchronous machines. Parallel operation on an infinite bus-bar. Industrial applications of synchronous machines as generators and motors, Faults on machines. **Course Aims:**	

	➢ Induction Machines: EEE302 aims to provide students with a comprehensive understanding of induction machines, including the construction, characteristics, and operation of wound rotor and squirrel cage rotor induction motors. The course covers torque/slip characteristics, performance prediction methods, losses, efficiency, speed control techniques, protection methods, and starting mechanisms for induction machines. ➢ Single-Phase Induction Motors: Students will learn about fractional horsepower motors and single-phase induction motors, including their construction, operating principles, characteristics, and industrial applications. ➢ Specialized Motors: EEE346 covers specialized motors such as reluctance motors and hysteresis motors, exploring their construction, working principles, characteristics, and applications in various industrial settings. ➢ Synchronous Machines: The course delves into the performance of synchronous machines, including the generation and utilization of rotating magnetic fields, the EMF equation, winding factors, equivalent circuits, and phasor diagrams for cylindrical rotor synchronous machines. ➢ Steady-State Performance: Students will analyze the steady-state performance of synchronous machines, focusing on characteristic features of salient synchronous machines and their industrial applications as generators and motors. ➢ Parallel Operation and Faults: EEE346 covers parallel operation of synchronous machines on an infinite bus-bar, discussing the conditions and considerations for efficient parallel operation. Additionally, the course addresses common faults encountered in electromechanical devices and machines and methods for their diagnosis and mitigation. **Learning Outcomes:** Upon completing EEE346, students should be able to: ➢ Describe the construction, characteristics, and operating principles of wound rotor and squirrel cage rotor induction motors. ➢ Analyze torque/slip characteristics, losses, power flow, efficiency, and speed control methods for induction machines. ➢ Explain the construction, characteristics, and applications of single-phase induction motors and fractional horsepower motors. ➢ Evaluate the design, operation, and applications of specialized motors such as reluctance motors and hysteresis motors. ➢ Understand the principles of operation and performance characteristics of synchronous machines, including cylindrical rotor synchronous machines and salient synchronous machines. ➢ Analyze phasor diagrams, equivalent circuits, and winding factors for synchronous machines. ➢ Assess the conditions and considerations for parallel operation of synchronous machines on an infinite bus-bar.	

	➢ Identify common faults in electromechanical devices and machines and apply diagnostic methods to mitigate these faults effectively. ➢ Through theoretical study, practical demonstrations, and hands-on exercises, students will develop the skills and knowledge necessary to analyze, design, operate, and maintain various electromechanical devices and machines encountered in engineering applications. 30 Hours Lecture	
EEE303	**Electric Circuit Theory I**	**3 UNITS**
	Electric quantities charges, voltage, current. Power, energy. Voltage and current sources, resistor, inductor and capacitor. Ohm's law. Kirchhoff's current and voltage laws. Thevenin and Norton equivalents, superposition, reciprocity, maximum power transfer theorem. Signal waveforms: d.c., step, impulse, square pulse, sinusoidal, exponential. General description of signals: time constant, rms value, duty cycle, crest factor, form factor. Effective alternating current. a.c. behavior in R, L and C elements. Phasor analysis with complex algebra, two terminal networks. Resonance: series and parallel resonance, half power points, bandwidth, Q-factors. Power: instantaneous, average, power factor, active, reactive, complex, apparent. Analysis of first order LR and RC circuits. Interpretation of complementary function and particular integral. Elementary network topology, network constants, network equilibrium equations. Nodal and mesh network analysis. L-attenuator, Image Parameter Design, T-attenuator, Pi-attenuator, Cascaded attenuator networks. Impedance transformations, constant impedance inverters. Norton's network transformation, Bartcett bisection theorem. Use software packages for design, analysis, and simulation. 45 Hours Lecture **Course Description:** Laplace and Fourier transforms, application of Laplace transformation to transient analysis of RLC circuits, transfer function concepts, reliability of functions, Foster and Causer's methods of Synthesis, 2-port network synthesis of non-linear resistive circuits, harmonic	

	analysis of non-linear dynamic circuits, applications of computers in the analysis of linear and non-linear circuits. Network graph theory, independent loop equations and independent node equations (loop and nodal analysis), Analysis of linear circuits using MATLAB, Network reduction by Tee-Pi transformations, maximum power transfer theorem, Millman's and Reciprocity theorems. **Course Aims:** ➢ Understanding Circuit Analysis Techniques: EEE303 aims to provide students with a comprehensive understanding of circuit theory and analysis techniques, including Laplace and Fourier transforms, transient analysis, and synthesis methods. ➢ Application of Circuit Analysis Tools: The course aims to equip students with the skills to apply Laplace and Fourier transforms, network graph theory, and computer-based analysis tools like MATLAB to analyze linear and non-linear circuits effectively. ➢ Synthesis and Network Reduction: EEE303 aims to familiarize students with synthesis methods such as Foster and Causer's methods, 2-port network synthesis, and network reduction techniques like Tee-Pi transformations to simplify complex circuits. **Learning Outcomes:** Upon completing EEE303, students should be able to: ➢ Apply Laplace and Fourier Transforms: Understand the principles of Laplace and Fourier transforms and apply them to analyze the transient behavior and harmonic content of RLC circuits. ➢ Analyze Linear Circuits: Use network graph theory, loop and nodal analysis techniques to analyze linear circuits, formulate equations, and solve for circuit parameters using MATLAB. ➢ Explore Synthesis Methods: Understand Foster and Causer's methods of synthesis and apply them to design and synthesize non-linear resistive circuits and 2-port networks. ➢ Perform Harmonic Analysis: Analyze non-linear dynamic circuits using harmonic analysis techniques to understand their behavior under varying operating conditions. ➢ Utilize Computer-Based Analysis: Apply computer-based analysis tools such as MATLAB to analyze both linear and non-linear circuits, simulate circuit responses, and validate theoretical results. ➢ Implement Network Reduction Techniques: Apply Tee-Pi transformations and network reduction techniques to simplify complex circuits, determine equivalent parameters, and facilitate analysis. ➢ Understand Theorems and Principles: Apply the maximum power transfer theorem, Millman's theorem, and reciprocity theorem to optimize circuit performance and analyze interrelationships between circuit elements.	

	➢ Solve Practical Circuit Problems: Utilize acquired knowledge and skills to solve practical circuit problems, design circuits with desired characteristics, and optimize circuit performance for specific applications. By achieving these learning outcomes, students will develop a strong foundation in circuit theory and analysis, enabling them to analyze, design, and optimize complex electrical circuits encountered in various engineering applications.	
CEN304	**Software Development Techniques**	**3 UNITS**
	Software development life cycle. Top-down design. Program design using pseudo-code, flowchart. Flowchart ANSI symbols and usage. Extensive examples and exercises using pseudo E code/flowchart to solve practical problems in engineering. Debugging and documentation techniques. Programming using a structured language such as C: Symbols, keywords, identifiers, data types, operators, various statements, operator precedence, type conversion, conditional and control structures, function, recursive functions. Arrays: 1-D, and multi-dimensional arrays, passing elements or whole array to a function. Simple sorting and searching on arrays, pointers, strings, dynamic memory allocation. Structures and Unions: Structure declaration and definition, accessing structures, array of structures, pointers and structure, union declaration, enumerated variables. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, and random-access files. Advanced Topics: Command line parameters, pointers to functions, creation of header files, stacks, linked lists, bitwise manipulation. Software development in C in MS Windows, UNIX/LINUX environments, header file, preprocessor directives, make, Make file. Static and dynamic linking libraries. Extensive examples, and exercises programming in C to solve practical problems in engineering. Exercises are to be done in the Computer Laboratory. 45 Hours Lecture **Course Description:** CEN 304 introduces students to fundamental software development techniques essential for engineering applications. The course covers various aspects of the software development life cycle, emphasizing top-down design methodologies, program design using pseudo-code and flowcharts, debugging, documentation techniques, and structured programming using languages like C. Students engage in extensive examples and exercises, applying pseudo E code/flowcharts to solve practical engineering problems.	

	Course Aim: The aim of CEN 304 is to provide students with a comprehensive understanding of software development techniques tailored for engineering applications. Through theoretical foundations and practical exercises, students will develop the skills necessary to design, implement, debug, and document software solutions effectively, with a focus on structured programming methodologies. **Learning Outcomes:** Upon successful completion of the course, students will be able to: ➢ Understand the software development life cycle and its application in engineering contexts. ➢ Apply top-down design principles to decompose complex engineering problems into manageable modules. ➢ Utilize pseudo-code and flowchart representations to plan and visualize program logic and control flow. ➢ Demonstrate proficiency in debugging techniques to identify and rectify errors in software implementations. ➢ Employ effective documentation techniques to enhance the readability and maintainability of software projects. ➢ Implement structured programming solutions using a language such as C to address engineering challenges. ➢ Apply software development techniques to solve practical engineering problems, incorporating pseudo E code/flowcharts as appropriate. ➢ Collaborate effectively in teams to design, develop, and evaluate software solutions in engineering domains.	
EEE305	**Electronics Engineering I**	**2 UNITS**
	Elementary Physical Electronics: Crystal structure; electron and energy band schemes. Semiconductor Fundamentals: materials, charge carrier behavior: majority carrier equilibrium behavior, non-equilibrium behavior under excitation such as radiation, temperature and voltage**.** FET and MOSFET: I-V characteristics and operating regimes (cut-off, linear and saturation). Charge control model, channel length modulation, back gate effect. Quasi-static equivalent circuit models (large and incremental models), High frequency models. Junction diodes, and transistors, FETS, SCR, photo resistors, diodes, transistors, photocell and light emitting diodes. Boolean algebra: Logic, Positive logic, Negative logic, De Morgan's law, Kanaugh Maps. Information:	

	Binary representation of information, Encoding information, Representation digital information with voltage, noise margins, statics discipline, sign magnitude representation, 1's CMOS logic, NAND, NOR, and Complex gates, Voltage transfer curves, Static dissipation. Single Stage Amplifiers. Common Source, Common Emitter, Common Emitter with Degeneration Resistors, Common Drain, Common Collector, Common Gate and Common Base. Combination Logic: Adders, Multiplexers, DE multiplexers and Synthesis of Combinational logic, n-bit adder, half adder, full-adder, two level and/synthesis, multiplexers, decoders, MUX & ROM, Combinational logic Synthesis, implementations of combinational logic using hardware description language such as Verilog. 30 Hours Lecture **Course Description:** Review of single – stage transistor amplifiers using BJTS and EETs Equivalent circuit and calculation of current gain, input and output impedance. Operational Amplifiers: parameters and applications. Feedback, Broadband and harrowed band amplifiers. Power amplifiers, Voltage and current stabilizing circuit. Voltage amplifiers, multi stage amplifier. Applications of BJTs and FETs. **Course Aims:** ➢ Review and Analysis of Single-Stage Transistor Amplifiers: EEE323 aims to provide a comprehensive review and analysis of single-stage transistor amplifiers using both bipolar junction transistors (BJTs) and field-effect transistors (FETs). This includes examining equivalent circuits and calculating critical parameters such as current gain, input impedance, and output impedance. ➢ Study of Operational Amplifiers (Op-Amps): The course aims to cover the parameters, characteristics, and applications of operational amplifiers. This includes understanding feedback mechanisms, broadband, and narrowband amplifiers, as well as their practical applications in electronic circuits. ➢ Exploration of Power Amplifiers and Stabilizing Circuits: EEE323 aims to delve into power amplifiers, voltage stabilizing circuits, and current stabilizing circuits. Students will learn about the design principles, characteristics, and applications of these circuits in various electronic systems. ➢ Understanding Multi-Stage Amplifiers: The course aims to provide students with a solid understanding of multi-stage amplifiers, including voltage amplifiers. Students will explore the	

	design, analysis, and applications of multi-stage amplifier configurations using BJTs and FETs. ➢ Practical Applications of BJTs and FETs: EEE323 aims to bridge theoretical concepts with practical applications by exploring the real-world applications of both BJTs and FETs in electronic circuits. This includes understanding their roles and performance characteristics in different circuit configurations. **Learning Outcomes:** Upon completing EEE305, students should be able to: ➢ Analyze Single-Stage Transistor Amplifiers: Understand the operation, equivalent circuits, and calculate key parameters of single-stage transistor amplifiers using BJTs and FETs, including current gain, input impedance, and output impedance. ➢ Apply Operational Amplifiers in Circuit Design: Understand the parameters and characteristics of operational amplifiers and apply them effectively in various electronic circuit configurations, including feedback mechanisms, broadband amplifiers, and narrowband amplifiers. ➢ Design and Analyze Power Amplifiers: Design and analyze power amplifiers, voltage stabilizing circuits, and current stabilizing circuits for different electronic applications, considering factors such as efficiency, stability, and linearity. ➢ Implement Multi-Stage Amplifiers: Design, analyze, and implement multi-stage amplifiers, including voltage amplifiers, using BJTs and FETs. Understand the interconnection of multiple amplifier stages and their impact on overall circuit performance. ➢ Evaluate Practical Applications: Evaluate and select appropriate transistor configurations (BJTs and FETs) for specific electronic circuit applications based on their performance characteristics, efficiency, and suitability. ➢ Troubleshoot and Optimize Circuits: Identify and troubleshoot common issues in transistor amplifier circuits and implement optimization techniques to improve circuit performance, stability, and reliability. ➢ Apply Theoretical Concepts: Apply theoretical concepts of transistor amplifiers, operational amplifiers, and feedback mechanisms to real-world electronic circuit design and analysis, considering practical constraints and requirements.	
EEE306	**Electric Circuit Theory II**	**2 UNITS**
	Fourier series: Representation of continuous time periodic signals, calculations of Fourier coefficients. Continuous time and discrete time. Fourier series and transforms. Laplace Transformation and its	

	Application: Laplace transforms applications to steady and transient state analysis of circuit. Reliability of transfer functions, Foster and Cauers methods of synthesis. 2-ports network synthesis. Filter: design, operation, low, high, Band pass. 30 Hours Lecture **Course Description:** EEE306 delves deeper into the theory and analysis of electrical circuits, focusing on advanced topics such as impedance parameters, Fourier series, signal classification, and time-invariant systems. The course emphasizes the analysis of signals and systems, convolution, correlation, and waveform synthesis. **Course Aims:** Two-Port Networks: Understanding open-circuit impedance parameters, short-circuit admittance parameters, hybrid parameters, and transmission parameters. Exploring the relationships between parameter sets and interconnections of two-port networks. Fourier Series and Signal Analysis: Studying Fourier series and the symmetry properties of non-sinusoidal waveforms. Performing empirical harmonic analysis and applying Fourier series in circuit applications. Calculating average power, root mean square (r.m.s) values, and applying Parseval's theorem. Signals and Systems: Classifying signals and systems and understanding signal operations and singularity functions. Analyzing time-invariant systems and studying convolution and correlation techniques. Waveform Synthesis: Exploring the shifted unit step function, ramp, and impulse functions. Understanding waveform synthesis techniques and determining the initial and final values of f(t) from F(s) using Laplace transforms. Applying the convolution integral to analyze and synthesize waveforms. **Learning Outcomes:** Upon completing EEE306, students should be able to: ➢ Analyze and characterize two-port networks using impedance and admittance parameters.	

	➢ Apply Fourier series to analyze non-sinusoidal waveforms and calculate average power and r.m.s values. ➢ Classify signals and systems, perform signal operations, and analyze time-invariant systems using convolution and correlation. ➢ Synthesize waveforms using shifted unit step functions, ramps, impulse functions, and Laplace transforms. ➢ Compute and interpret convolution integrals to analyze and synthesize waveforms accurately.	
EEE 307	**Electromagnetic Field Theory**	**2 UNITS**
	Review of Electrostatics: Coulomb's law, electric fields, electric scalar potential, permittivity, Gauss 'Law and electric flux, method of images, energy density, coaxial cables, applications. Review of magneto static fields: magnetic fields, biot- savart law, forces between conductors, magnetic flux, ampere's law, Maxwell's static equations, magnetic vectors potential, energy density, coaxial cables and applications ferromagnetic: magnetic dipoles, relative permeability, magnetic vectors, ferromagnetism, boundary conditions. Boundary value problems: boundary value problems, methods of solution, poison's and Laplace equations. Time varying magnetic and electric fields; conduction and displacement current in magnetic vector potential. 30 Hours Lecture **Course Description:** Electromagnetism; magnetic circuit; magnetizing curve; characteristics of magnetic materials; Electromagnetic Induction; Excitation of Magnetic Circuits; Hysteresis and Eddy Current Losses; Energy Stored in Magnetic Circuits. Electric Charge and the law of electrostatics; Electric Field and lines of forces; Electrostatic Induction; Electric Field Intensity; A charge particle in an Electric Field; Electric Flux and Electric Flux Density; Electrical Potential and Energy; Dielectric Materials and their Properties; Poisson's Equation and Laplace's Equation; Capacitor; Insulation, Resistance of a cable; Energy stored in a capacitor. **Course Aims:** ➢ Understanding Electromagnetism Fundamentals: EEE307 aims to provide students with a comprehensive understanding of the fundamental principles of electromagnetism, including magnetic circuits, electromagnetic induction, and the behavior of magnetic materials.	

	➢ Exploring Electric Charge and Fields: The course aims to explore the concept of electric charge, electrostatics, and electric fields, enabling students to understand the behavior of charged particles and the properties of electric fields. ➢ Studying Energy Storage in Electromagnetic Systems: EEE307 aims to educate students about energy storage mechanisms in electromagnetic systems, including magnetic circuits and capacitors, and the factors affecting energy storage and losses. **Learning Outcomes:** Upon completing EEE307, students should be able to: ➢ Analyze Magnetic Circuits: Understand the principles of magnetic circuits, including magnetizing curves, magnetic materials characteristics, and the excitation of magnetic circuits. ➢ Comprehend Electromagnetic Induction: Explain the phenomenon of electromagnetic induction and its applications, including the generation of induced electromotive force and the effects of hysteresis and eddy currents. ➢ Evaluate Electric Charge and Fields: Analyze the behavior of electric charges, electric fields, and lines of forces, including electrostatic induction, electric field intensity, and electric flux density. ➢ Understand Dielectric Materials and Capacitors: Comprehend the properties of dielectric materials, the behavior of capacitors, and the storage of electrical energy in capacitors. ➢ Apply Poisson's Equation and Laplace's Equation: Apply Poisson's equation and Laplace's equation to analyze electrostatic fields and potential distributions in different dielectric media and configurations. ➢ Analyze Insulation and Cable Resistance: Evaluate the insulation properties of materials, cable resistance, and factors affecting the performance of electrical cables. ➢ Calculate Energy Storage and Losses: Calculate the energy stored in magnetic circuits and capacitors, and analyze the factors contributing to hysteresis and eddy current losses in electromagnetic systems. ➢ Apply Electromagnetic Concepts to Practical Scenarios: Apply the principles of electromagnetism to analyze and solve practical engineering problems related to magnetic circuits, capacitors, and dielectric materials.	
EEE308	**Electrical and Electronics Lab. II**	**1 UNITS**
	A Laboratory work designed to demonstrate topics covered in second semester 300-level courses: measurement and instrumentation, electric circuits' theory of electronics engineering; electromagnetic wave	

	theory and electric machines (transformer and AC machines). Laboratory work involves Winding of Transformer and protective devices; confirmation of semi-conductor-Op Amp; timing circuit. 15 Hours Lecture **Course Description:** EEE308 is a laboratory-based course aimed at providing students with hands-on experience and practical skills in the areas of Digital Electronic Circuits, Control Engineering, and Electrical Machines. The course complements theoretical knowledge gained in related courses by offering students the opportunity to apply concepts learned in a laboratory setting. **Course Aims:** ➢ Digital Electronic Circuits: The laboratory sessions aim to reinforce the understanding of digital electronic circuits covered in theoretical courses. Students will design, build, test, and troubleshoot digital circuits using various logic gates, flip-flops, counters, registers, and other digital components. ➢ Control Engineering: Students will perform experiments related to control systems and feedback mechanisms. They will design and analyze control systems, implement controllers, and study the behavior of dynamic systems in real-time scenarios. ➢ Electrical Machines: The laboratory work focuses on the practical aspects of electrical machines, including motors, generators, and transformers. Students will conduct experiments to analyze the performance characteristics, efficiency, and control methods of electrical machines. **Learning Outcomes:** Upon completing EEE308, students should be able to: ➢ Design, build, and analyze digital electronic circuits using logic gates, flip-flops, counters, and other digital components. ➢ Implement control systems and study their behavior using feedback mechanisms, controllers, and dynamic systems. ➢ Perform experiments to analyze the performance characteristics, efficiency, and control methods of electrical machines such as motors, generators, and transformers. ➢ Apply principles of safety and good laboratory practices in conducting experiments and handling electrical and electronic equipment. ➢ Interpret experimental data, draw conclusions, and communicate findings effectively through laboratory reports and presentations. ➢ Collaborate effectively with peers in laboratory settings, demonstrating teamwork and problem-solving skills.	

EEE309	**Signals and Systems**	**2 UNITS**
	Continuous signals and systems: block diagrams, linearity, causality, stability and time invariance, linear time-invariant (LTI) systems, impulse response; Convolutions sum and integral; convolution and correlation; introduction to stochastic Signals. Fourier techniques in signals and systems: Fourier series and transforms of signals; Frequency response of continuous time LTI circuits and systems; Fourier transforms and continuous spectra; Applications, Correlation and power spectrum Fourier and Laplace transforms important concepts such as impulse response, frequency response and system transfer functions as well as design, modulation, and sample. Includes lectures and demonstrations. 30 Hours Lecture **Course Description:** **Laplace transforms:** – theorems on Laplace transforms, inverse transforms, solution of differential equations by Laplace transforms, and simultaneous differential equations. **Fourier series –:** periodic functions, trigonometric series, Fourier coefficients, Functions of arbitrary period, even and odd functions, half-range series, Complex form of Fourier series. **Multiple Integrals**: – Iterated integrals, multiple integrals over elementary regions, line integrals, double integrals, surface integrals, volume integrals, and Change of variables. **Vector Algebra:** – scalar and vector fields, gradient and directional derivative, divergence, curl, Line and surface integrals, Stokes' theorem, Green's theorem, volume integrals, divergence theorem, Orthogonal transformations, scale factors, basis vectors, Cylindrical and spherical polar coordinate systems, gradient, divergence and curl in these systems. **Z- transforms:** –properties of z-transforms, inverse transforms, recurrence relations, and initial terms. **Partial Differential Equations: –** Elementary properties of Gamma, Beta, Error, Bessel functions and Legendre polynomials, Basic concepts of partial differential equations, Classification of 2^{nd} order linear partial differential equation into basic types, the principle of superposition, the wave diffusion and Poisson's equations, Boundary and initial-value problems, Alembert's solution for wave equation, Method of separation of variables, Bi-harmonic equation. **Course Aims:**	

	To Provide a Comprehensive Understanding: The aim of Engineering Analysis III is to provide students with a comprehensive understanding of advanced mathematical techniques and tools essential for engineering analysis. To Develop Problem-Solving Skills: The course aims to develop students' problem-solving skills by exposing them to a wide range of mathematical concepts and their applications in engineering. To Prepare Students for Advanced Engineering Studies: Engineering Analysis III aims to prepare students for more advanced courses and real-world engineering challenges by equipping them with a strong foundation in mathematical analysis. **Learning Outcomes:** Upon completion of Engineering Analysis III, students should be able to: ➢ Apply Laplace Transforms: Understand and apply theorems on Laplace transforms, perform inverse transforms, and use Laplace transforms to solve differential equations, including simultaneous differential equations. ➢ Utilize Fourier Series Analysis: Analyze periodic functions using Fourier series, compute Fourier coefficients, and understand the complex form of Fourier series. Identify even and odd functions and apply half-range series. ➢ Master Multiple Integrals: Compute iterated integrals and multiple integrals over elementary regions. Understand and apply line integrals, double integrals, surface integrals, and volume integrals, including techniques for change of variables. ➢ Understand Vector Algebra and Calculus: Manipulate scalar and vector fields, compute gradients, directional derivatives, divergences, and curls. Apply Stokes' theorem, Green's theorem, and the divergence theorem. Understand orthogonal transformations and basis vectors. ➢ Work with Z-Transforms: Understand properties of Z-transforms, perform inverse transforms, and solve recurrence relations using Z-transforms. Apply Z-transforms to analyze signals and systems. ➢ Solve Partial Differential Equations (PDEs): Understand elementary properties of special functions such as Gamma, Beta, Error, Bessel functions, and Legendre polynomials. Classify second-order linear PDEs into basic types and apply methods like separation of variables and Alembert's solution for wave equation. ➢ Apply Mathematical Concepts to Engineering Problems: Apply the learned mathematical concepts and techniques to solve engineering problems in various domains, including signal processing, fluid dynamics, heat transfer, and structural analysis. ➢ Demonstrate Critical Thinking and Analytical Skills: Develop critical thinking and analytical skills necessary for analyzing complex engineering systems and phenomena using mathematical tools and models.	

	By achieving these learning outcomes, students will be well-prepared to tackle advanced engineering problems and contribute effectively to engineering research and development initiatives.	
EEE310	**Electromagnetic Wave Theory**	**2UNITS**
	Maxwell's equations: Derivation of Maxwell's equation, consideration of various media. Electromagnetic potential and waves: pointing vector; Boundary conditions; wave propagation in good conductors, skin effect, plane waves and unbounded dielectric media: reflection and transmission of electromagnetic waves across boundaries of different media, Propagation of electromagnet waves in ionized media. Fundamentals of transmission lines, matching, voltage reflection coefficient, standing wave ratio, wave guides and antennas. Applications of wave theory in communication. 30 Hours Lecture **Course Description:** EEE310 is an advanced course in electromagnetics that builds upon fundamental concepts covered in introductory courses. This course explores Maxwell's equations, wave propagation, transmission lines, and antenna theory. Students delve into the principles underlying electromagnetic field behavior and wave propagation in various media. **Course Aims:** Review of Electromagnetic Laws: Reinforcing integral forms of electromagnetic laws such as Gauss's law, Biot-Savart Law, Ampere's law, and Faraday's laws. Understanding Stokes theorem and divergence theorem in the context of electromagnetic fields. Maxwell's Equations: Deriving Maxwell's equations in both differential and integral forms. Exploring the significance of conduction and displacement currents in electromagnetic phenomena. Wave Propagation: Analyzing wave propagation in good conductors and understanding the skin effect. Investigating the behavior of plane waves in unbounded dielectric media and calculating the Poynting vector. Transmission Lines:	

	Understanding the fundamentals of transmission lines and their application in signal transmission. Using Smith charts for impedance matching and analyzing single and double stub matching techniques. Waveguides and Antennas: Exploring common waveguide structures and understanding wave propagation and attenuation in guides. Studying antenna theory, including antenna fundamentals and characteristics. **Learning Outcomes:** Upon completing EEE310, students should be able to: ➢ Apply integral forms of electromagnetic laws to analyze complex electromagnetic systems. ➢ Derive and interpret Maxwell's equations in both differential and integral forms. ➢ Analyze wave propagation in different media, including conductors and dielectrics. ➢ Calculate the Poynting vector and understand its significance in electromagnetic wave propagation. ➢ Design and analyze transmission lines using Smith charts and impedance matching techniques. ➢ Understand the principles of waveguides and antennas and their applications in communication systems.	
EEE311	**Engineering Mathematics III**	**3 UNITS**
	Numerical analysis and its application to engineering problems. Operational methods, transform, series and special functions in engineering 45 Hours Lecture EEE311 Engineering Mathematics III introduces students to numerical analysis and its applications in solving engineering problems. The course covers operational methods, transforms, series, and special functions commonly used in engineering applications. Through theoretical study and practical exercises, students will develop a deep understanding of numerical techniques and their relevance in solving real-world engineering problems. **Aim:** The aim of EEE311 Engineering Mathematics III is to equip students with the necessary mathematical tools and analytical skills required to address complex engineering problems using numerical methods. By the end of the course, students should be able to apply numerical	

	techniques confidently to model, analyze, and solve engineering problems encountered in various disciplines. **Learning Outcomes:** Upon successful completion of EEE311 Engineering Mathematics III, students should be able to: ➢ Understand the fundamental principles of numerical analysis and its significance in engineering applications. ➢ Apply numerical techniques such as interpolation, numerical integration, and numerical solution of differential equations to solve engineering problems. ➢ Analyze the limitations and errors associated with numerical methods and develop strategies to mitigate them. ➢ Demonstrate proficiency in utilizing operational methods, transforms, series, and special functions to solve engineering problems. ➢ Utilize software tools and programming languages effectively to implement numerical algorithms and analyze engineering data. ➢ Interpret and communicate mathematical solutions to engineering problems effectively both orally and in written form.	
EEE312	**Engineering Mathematics IV**	**3 UNITS**
	Mathematical modeling of physical systems, numerical techniques, boundary value problems, Fourier integral, Fourier series, orthogonal functions and Sturm-Louville systems. Partial differential equations including theory, classification and solution by various methods. Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturn-Louville boundary value problems. Solutions of equations in two and three dimensions by separation of variables. Eigen value problems. Use of operations in the solution of partial differential equations and Linear integral equations. Integral transforms and their inverse including Fourier, Laplace, Mellin and Handel Transforms. Convolution integrals and Hilbert Transforms. Calculus of finite differences. Interpolation formulae. Finite difference equations. RungeKutta and other methods in the solutions of ODE and PDEs. Numerical integration and differentiation.	

	Course Description: EEE312 Engineering Mathematics IV delves into the advanced mathematical concepts crucial for modeling and analyzing physical systems encountered in engineering. The course covers mathematical modeling techniques, numerical methods, boundary value problems, Fourier analysis, partial differential equations (PDEs), integral transforms, calculus of finite differences, and various solution methods for ordinary and partial differential equations. **Aim:** The aim of EEE312 Engineering Mathematics IV is to equip students with advanced mathematical tools and techniques essential for analyzing and solving complex engineering problems. By the end of the course, students should have a solid understanding of mathematical modeling, numerical methods, differential equations, integral transforms, and their applications in engineering contexts. **Learning Outcomes:** By the end of the course, students should be able to: ➢ Apply mathematical modeling techniques to describe physical systems encountered in engineering. ➢ Utilize numerical techniques to solve engineering problems, including boundary value problems and differential equations. ➢ Understand Fourier analysis principles, including Fourier series and Fourier integrals, and apply them to analyze periodic phenomena and signals. ➢ Classify partial differential equations according to their types and solve them using various methods such as separation of variables, eigenfunction expansions, and transform methods. ➢ Apply integral transforms, including Fourier, Laplace, Mellin, and Hankel transforms, to solve differential equations and analyze signals and systems in the frequency domain. ➢ Implement calculus of finite differences to approximate derivatives and integrals numerically, particularly in engineering applications. ➢ Employ interpolation formulas, Runge-Kutta methods, and other numerical techniques to solve ordinary and partial differential equations efficiently and accurately in engineering contexts. ➢ Analyze and interpret solutions obtained through numerical methods to draw meaningful conclusions about the behavior of engineering systems.	
EEE313	**Electromechanical Devices and Machines I**	**2 UNITS**
	Review of principles of electromagnetic energy conversion; general rotating machines. Principles of coil windings- lap, wave windings.	

	Design, construction and characteristics of DC machines. Performance of DC machines: starting and speed control of shunt series and compound motors. Transformer: design construction fundamentals. Equivalent circuit analysis, open and short circuit tests. Regulation. Autotransformers and three- phase transformers: design and performance; connections and parallel operations Principle of electromechanical energy conversion, rotating magnetic fields. DC Machines (DC Generators and DC Motors): design, construction, structures, windings and characteristics, emf equations, armature reaction and commutation, losses and efficiency. Performance and speed control of DC machines. Industrial application of DC machines. Transformer: Elements of a transformer, flux linkages, windings/voltage/current ratios of transformers, ideal transformer, leakages inductances, circuit model of the iron-core transformer, impedances of a transformer, transformer losses and efficiency, transformer tests (open circuit and short circuit tests), voltage regulation. 3-phase transformers, parallel operation of 3-phase transformers, circle diagrams, Auto-transformer and their applications. Instrument transformers. **Course Aims:** ➢ Understanding Electromechanical Energy Conversion: EEE313 aims to provide students with a comprehensive understanding of the principles of electromechanical energy conversion, focusing on rotating magnetic fields and their applications. ➢ Comprehensive Study of DC Machines: The course aims to cover the design, construction, characteristics, and performance of DC machines, including generators and motors. Students will learn about armature reaction, commutation, losses, efficiency, and speed control of DC machines. ➢ In-depth Study of Transformers: EEE313 aims to delve into the theory and operation of transformers, covering elements, windings, ideal transformers, losses, efficiency, and transformer tests. Students will explore 3-phase transformers, parallel operation, circle diagrams, auto-transformers, and instrument transformers. ➢ Application-Oriented Learning: The course aims to provide insights into the industrial applications of DC machines and transformers, enabling students to understand their practical relevance and significance in various engineering fields. **Learning Outcomes:** Upon completing EEE313, students should be able to: ➢ Explain Electromechanical Energy Conversion Principles: Understand the fundamental principles of electromechanical	

	energy conversion, including the generation of rotating magnetic fields and their application in electrical machines. ➢ Analyze DC Machines: Analyze the design, construction, and performance characteristics of DC machines, including generators and motors. Understand the principles of armature reaction, commutation, losses, and efficiency in DC machines. ➢ Demonstrate Competence in DC Machine Control: Apply techniques for speed control and performance optimization of DC machines in various industrial applications. ➢ Understand Transformer Theory and Operation: Understand the theory of transformers, including elements, windings, ideal transformer concepts, losses, efficiency, and voltage regulation. Perform open circuit and short circuit tests and analyze transformer performance. ➢ Analyze 3-Phase Transformers: Analyze the operation and characteristics of 3-phase transformers, including parallel operation, circle diagrams, and applications in power distribution systems. ➢ Explain Auto-transformer Operation: Understand the principles of auto-transformers and their applications in voltage regulation and power transmission systems. ➢ Apply Knowledge to Industrial Applications: Apply acquired knowledge and skills to analyze and design systems involving DC machines and transformers in industrial settings, considering factors such as efficiency, reliability, and performance optimization. ➢ Perform Transformer Tests: Conduct and interpret transformer tests, including open circuit and short circuit tests, to determine performance parameters and validate theoretical concepts.	
EEE314	**Electronics Engineering II**	**3 UNITS**
	Frequency response of Single Stage Amplifier: Review of Bode plot, intrinsic frequency response of MOSFETs and BJTs, Frequency response of CS and CE stages, Frequency response of CG and CB stages, Frequency response of CD and CC stages. Methods of analyzing Frequency response. Multistage Transistor Amplifiers: Trans-conductance amplifiers, trans-resistance amplifiers, voltage, current and power amplifiers. Voltage buffers and current buffers. Impedance matching, methods of amplifier stage coupling-AC coupling, DC coupling and level shifting. DC voltage and current sources, cascaded circuits. Switching properties of electronic devices, switching and wave-shaping circuits. Generation of non-sinusoidal waveforms; a	

	stable, monostable and bistable multi-vibrators, comparator. Analysis and design of logic gates of various families. Diode logic, RTL, TTL, RCL, MOS and CMOS of digital integrated circuits. Interfacing between various logic families. Programmable/Reconfigurable Logic: Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs): AND plane, OR plane, Standard cell libraries, gate arrays, Sea of gates. Sequential Logic: Timing and States, Dynamics discipline, storage and States, Storage using capacitors and Storage using feedback (SRAM DRAM). Clocked Sequential Circuits: Finite state machines, dynamic discipline, concept of discrete state and time, FSM implementations, Moore vs. Mealy machine, valley state diagrams and unreachable states, FSM simplification. Introduction to analog-to-digital and digital-to-analog conversion principles. **Course Description:** Number Systems and Codes. Logic Gate Simplification of Logic expressions using Boolean Algebra. Simplification of logic expressions using Karnaugh method. Design of sequential and combinational circuit. Flip – Flops in the design of counters, registers and timers. Switching and waves shaping circuits. General of non-sinusoidal signal (multi vibrators). Introduction to ADC and DAC. Designed of Logic Gates (Diode, DTL, TTL, ECL etc) **Course Aims:** ➢ Number Systems and Codes: EEE314 aims to provide students with a comprehensive understanding of number systems and codes used in digital electronics, including binary, octal, decimal, and hexadecimal systems. Students will learn the conversion between different number systems and the representation of numbers in various codes such as BCD and Gray codes. ➢ Logic Gate Simplification: The course covers the simplification of logic expressions using Boolean algebra and Karnaugh maps. Students will learn techniques to minimize logic circuits while preserving functionality and optimizing performance. ➢ Sequential and Combinational Circuits: EEE314 introduces students to the design and analysis of sequential and combinational circuits. Topics include the design and implementation of basic logic gates, multiplexers, demultiplexers, encoders, decoders, and adders. ➢ Flip-Flops and Registers: Students will study flip-flops and their applications in the design of counters, registers, and timers. The course explores various types of flip-flops such as SR, D, JK, and	

	T flip-flops, their characteristics, and their role in digital circuit design. ➢ Switching and Wave Shaping Circuits: EEE314 covers switching circuits and waveform shaping techniques used in digital electronics. Topics include pulse generators, multivibrators, astable, monostable, and bistable multivibrators, and their applications in digital systems. ➢ Analog-to-Digital and Digital-to-Analog Conversion: The course provides an introduction to analog-to-digital (ADC) and digital-to-analog (DAC) conversion techniques. Students will learn about different types of ADC and DAC circuits and their implementation in digital systems. ➢ Logic Gate Design: Students will explore the design and characteristics of logic gates such as diode gates, DTL (Diode-Transistor Logic), TTL (Transistor-Transistor Logic), and ECL (Emitter-Coupled Logic). The course discusses the operation, advantages, and limitations of each type of logic gate. **Learning Outcomes:** Upon completing EEE314, students should be able to: ➢ Demonstrate a thorough understanding of number systems and codes used in digital electronics, including binary, octal, decimal, and hexadecimal systems. ➢ Apply Boolean algebra and Karnaugh maps to simplify logic expressions and optimize digital circuits. ➢ Design, analyze, and implement sequential and combinational digital circuits using basic logic gates, multiplexers, demultiplexers, encoders, decoders, and adders. ➢ Explain the principles and operation of flip-flops and their applications in counters, registers, and timers. ➢ Design and analyze switching circuits and waveform shaping circuits, including pulse generators and multivibrators. ➢ Describe the principles of analog-to-digital and digital-to-analog conversion and implement ADC and DAC circuits in digital systems. ➢ Evaluate the characteristics and design considerations of different types of logic gates, including diode gates, DTL, TTL, and ECL gates. ➢ Through theoretical study, practical laboratory experiments, and project work, students will develop the skills and knowledge necessary to design, analyze, and troubleshoot digital electronic circuits for various applications in engineering and technology.	
EEE315	**Electrical / Electronic Laboratory 1**	**2 UNITS**

	A laboratory work designed to demonstrate topic covered in first semester 300- level courses: measurement and instrumentation, electric circuits' theory of electronics engineering; and electric machines (transformer and DC machines). Laboratory work involves soldering Techniques, use of measuring instruments, identification of semiconductors, application of circuits, DC machines operational characteristics and transformer testing. **Course Description:** A laboratory work is designed to illustrate topics covered in Electric Circuit Theory, Electronic Circuit and Electrical Machines. **Course Aims:** ➢ Practical Application of Electric Circuit Theory: EEE315 aims to provide students with hands-on experience to reinforce concepts learned in Electric Circuit Theory. Through laboratory experiments, students will gain practical insights into circuit analysis, measurement techniques, and circuit behavior. ➢ Demonstration of Electronic Circuit Principles: The course aims to demonstrate the principles of electronic circuits through laboratory exercises. Students will explore the behavior of semiconductor devices, operational amplifiers, and other electronic components commonly used in electrical engineering applications. ➢ Illustration of Electrical Machines Operation: EEE315 aims to illustrate the operation and characteristics of electrical machines through laboratory activities. Students will have the opportunity to interact with various electrical machines, such as generators, motors, and transformers, to understand their behavior and performance. **Learning Outcomes:** Upon completing EEE315, students should be able to: ➢ Apply Circuit Analysis Techniques: Apply circuit analysis techniques learned in Electric Circuit Theory to analyze and troubleshoot electrical circuits in laboratory experiments. This includes using techniques such as nodal analysis, mesh analysis, and Thevenin's theorem. ➢ Design and Implement Electronic Circuits: Design, construct, and test electronic circuits based on principles learned in Electronic Circuit courses. Students will gain practical experience in building circuits using components such as diodes, transistors, and integrated circuits. ➢ Operate and Analyze Electrical Machines: Operate various electrical machines present in the laboratory, including generators, motors, and transformers. Students will analyze the	

	performance characteristics of these machines and understand their applications in different engineering contexts. ➢ Use Laboratory Equipment Safely: Demonstrate proficiency in using laboratory equipment safely and effectively. This includes oscilloscopes, function generators, multimeters, power supplies, and other testing instruments commonly used in electrical engineering laboratories. ➢ Interpret Experimental Results: Analyze and interpret experimental data obtained from laboratory measurements and observations. Students will learn to compare theoretical expectations with practical results, identify discrepancies, and propose explanations. ➢ Troubleshoot Circuit and Machine Issues: Identify and troubleshoot common issues encountered during laboratory experiments. Students will develop problem-solving skills to diagnose faults, rectify circuit errors, and optimize machine performance. ➢ Document Laboratory Procedures and Results: Document laboratory procedures, observations, and results in formal lab reports following standard engineering practices. Students will communicate their findings effectively, including circuit diagrams, measurement data, and analysis conclusions. By achieving these learning outcomes, students will develop practical skills, critical thinking abilities, and hands-on experience essential for success in electrical engineering practice, research, and further study.	
EEE316	**Introduction to Communication Engineering**	**2 UNITS**
	Brief historical development on communications: Telegraph, telephony, radio, satellite, data, optical and mobile communications. Facsimile. Block and diagram of a communication system. The frequency spectrum. Signal and vectors, orthogonal functions. Fourier series, Fourier integral, signal spectrum. Convolution, power and energy, correlation. Types of Modulation: Reason. Types. Amplitude modulation. Comparison of AM systems Methods of generating, and detecting AM, DBS, SSB signals. Vestigial sideband. Frequency mixing and multiplying, frequency division multiplexing, applications of AM systems. Frequency modulation systems: frequency deviation, modulation index, Bessel coefficients. Bandwidth, power of an FM signal, narrowband FM, direct and indirect FM generation, various methods of FM demodulation, discriminator, Phase-lock loop; limiter,	

	pre-emphasis and de-emphasis, stereophonic FM broadcasting Noise waveforms and characteristics. Thermal noise, shot, noise figure and noise temperature. Cascade network. Effect of noise on AM FM systems. Block diagram of a super heterodyne AM radio receiver, AM and FM broadcast band and specification. Signal sensitivity, aerial circuit, RF amplifier design, frequency mixer, local oscillator design, and Interferences broadcast band specification and block diagram of radio receiver, limiter and ration detector, automatic frequency block control, sequel circuit, FM mono and FM stereo receivers. TV broadcast band and specification. Signal format, transmitter and receiver block diagrams of analogue TV system. **Course Description:** Telecommunication fundamentals, industry history, regulations, standards (local and global). Block diagram description and classifications of communication system. Analogy between vectors and signals: orthogonal functions, periodic function by the Fourier series, Fourier transform and convolution. Amplitude modulation; double sideband, single sideband and vestigial sideband modulation schemes; simple modulators, power and bandwidth performance. Angle modulation; frequency modulation, phase modulation, bandwidth requirements, clippers and limiters. Amplitude modulated signal reception; discrimination, frequency tracking loop, phase locked loop and noise performance. Commercial radio systems, Transmission media; attenuation in open space, air cable and fiber channels; construction of cables and fibers, sampling theorem, pulse amplitude modulation, pulse width modulation, multiplicity, quantization systems and pulse code modulation, delta modulation, courses and correction of errors in PCM and DM. **Course Aims:** ➢ Telecommunication Fundamentals: EEE316 aims to provide students with a comprehensive understanding of telecommunication principles, including the historical context, industry regulations, and global standards governing telecommunications systems. ➢ Communication System Overview: The course introduces students to the block diagram description and classification of communication systems. Students will gain insight into the components and functions of communication systems, enabling them to analyze and design such systems effectively. ➢ Signal Analysis and Modulation Techniques: EEE316 covers signal analysis techniques, including orthogonal functions, periodic functions, Fourier series, and Fourier transform. Students will learn about modulation techniques such as amplitude modulation (AM), frequency modulation (FM), and	

	phase modulation (PM), including their principles, bandwidth requirements, and modulation schemes. ➢ Amplitude Modulation (AM): Students will delve into the principles and performance characteristics of amplitude modulation, including double sideband, single sideband, and vestigial sideband modulation schemes. The course explores simple modulators, power considerations, bandwidth efficiency, and modulation techniques. ➢ Angle Modulation (FM and PM): EEE316 covers angle modulation techniques, including frequency modulation (FM) and phase modulation (PM). Students will learn about bandwidth requirements, modulation principles, and the implementation of FM and PM in communication systems. ➢ Signal Reception and Processing: The course addresses the reception of amplitude modulated signals, including discrimination, frequency tracking loop, phase-locked loop, and noise performance considerations. Students will understand the practical aspects of signal reception and processing in commercial radio systems. ➢ Transmission Media and Channel Characteristics: Students will explore different transmission media, including open space, air, cables, and fiber channels. The course covers attenuation characteristics, construction, and performance considerations of various transmission media. ➢ Digital Modulation Techniques: EEE316 introduces students to digital modulation techniques, including pulse amplitude modulation (PAM), pulse width modulation (PWM), multiplexing, quantization systems, pulse code modulation (PCM), and delta modulation (DM). Students will learn about error detection and correction techniques in PCM and DM systems. **Learning Outcomes:** Upon completing EEE316, students should be able to: ➢ Understand the fundamentals, regulations, and standards of telecommunication systems. ➢ Analyze and classify communication systems based on block diagrams and functional components. ➢ Apply signal analysis techniques to analyze communication signals and understand modulation principles. ➢ Design and evaluate amplitude modulation (AM) and angle modulation (FM, PM) schemes for communication systems. ➢ Assess signal reception techniques and processing methods for amplitude modulated signals. ➢ Evaluate transmission media characteristics and their impact on communication system performance. ➢ Design and analyze digital modulation techniques, including PAM, PWM, PCM, and DM, considering error correction methods.	

	➢ Apply theoretical knowledge to practical scenarios and solve problems related to communication principles effectively. By achieving these learning outcomes, students will develop the necessary skills and knowledge to analyze, design, and optimize communication systems for various applications in the telecommunications industry.	
ESP311	**Introduction to Entrepreneurial Studies II**	**2 UNITS**
	Some of the ventures to be focused upon include the following: Soap/ detergent; Tooth brushes and tooth paste making; Photography; Bricks, nails, screws making; Dyeing/ textile blocks paste making; Rope making; Plumbing; Vulcanizing; Brewing; Glassware production/ceramic, production; Paper production; Water treatment/conditioning packaging; Food processing/packaging/preservation; Metal working/fabrication- steel and aluminium doors and windows; Training industry; Vegetable oil/and salt extractions; Fisheries /Aquaculture; Refrigerator /Air conditioning; Plastic making; Farming (crop); Domestic Electrical writing; Radio/TV repairs; Carving; Weaving; Brick laying/making; Bakery; Tailoring; Iron welding; Building drawing; Carpentry; Leather tanning; Interior decoration; Printing; Animal husbandry (poultry, piggery, goat etc.); Metal Craft – Blacksmith, Tinsmith etc.; Sanitary wares; Vehicle maintenance; Bookkeeping. 30 Hours Lecture; 45 Hours Practical **Course Description:** ESP311 builds on the foundational knowledge gained in ESP310 and delves deeper into the practical aspects of entrepreneurial ventures across various industries. This course provides students with a comprehensive understanding of the entrepreneurial process and management principles applicable to a diverse range of ventures. Through case studies, interactive lectures, and hands-on activities, students explore the intricacies of starting, managing, and sustaining businesses in sectors such as manufacturing, service, and agriculture. **Course Aim:** The aim of ESP311 is to equip students with the essential skills, knowledge, and mindset required to identify, evaluate, and pursue entrepreneurial opportunities in a variety of industries. By examining real-world examples and engaging in practical exercises, students will	

develop the confidence and capabilities to launch and manage successful ventures while addressing the challenges inherent in entrepreneurship.

Learning Outcomes:

Upon successful completion of ESP311, students will be able to:

- Identify and Evaluate Entrepreneurial Opportunities: Students will learn to identify potential entrepreneurial opportunities within various industries, including but not limited to soap/detergent production, photography, textiles, food processing, and vehicle maintenance. They will develop the ability to evaluate the feasibility and potential viability of these opportunities using relevant frameworks and tools.
- Develop Business Plans and Strategies: Students will gain practical experience in developing comprehensive business plans and strategies tailored to specific entrepreneurial ventures. Through hands-on exercises and case studies, they will learn to formulate effective marketing, operations, and financial strategies to achieve sustainable growth and competitive advantage.
- Understand Industry-specific Challenges and Best Practices: Students will acquire a deep understanding of the unique challenges and best practices associated with different industries, ranging from manufacturing to service-oriented businesses. They will explore topics such as supply chain management, quality control, regulatory compliance, and customer service excellence relevant to their chosen ventures.
- Apply Entrepreneurial Skills and Mindset: Through experiential learning activities and simulations, students will develop and apply essential entrepreneurial skills such as creativity, innovation, problem-solving, and resilience. They will cultivate an entrepreneurial mindset characterized by adaptability, resourcefulness, and a willingness to embrace ambiguity and uncertainty.
- Promote Sustainable Business Practices: Students will explore the importance of integrating sustainable business practices into entrepreneurial ventures, including environmental stewardship, social responsibility, and ethical decision-making. They will learn to balance economic objectives with broader societal and environmental considerations to create long-term value for stakeholders and communities.
- Communicate Effectively and Collaborate: Students will enhance their communication and collaboration skills through group projects, presentations, and discussions. They will learn to effectively communicate their ideas, vision, and value proposition to stakeholders, including investors, customers, employees, and partners, fostering trust and building mutually beneficial relationships.

BME401	Engineering Statistics	2 UNITS
	Probability and Statistics: Probability space, theorems. Conditional probability and independence. random variables, discrete and continuous distributions, mean and variance. Bernouli, Binomial, Poisson, hypergeometric, exponential, normal distributions and their characteristics. Examples of experimental measurement and reliability. Elementary sampling theory for normal population. Central limit theorem. Statistical inference (point and interval estimation and hypothesis testing) on means, proportions and variances. Power and operating characteristics of tests. Chi-squares test of goodness of fit. Simple linear regressions. **Course Description:** Probability and Statistics: Probability space, theorems, Conditional probability and independence, random variables, discrete and continuous distributions, mean and variance; Bernoulli, Binomial, Poisson, hyper-geometric, exponential, normal distributions and their characteristics; Examples of experimental measurement and reliability, Elementary sampling theory for normal population; central limit theorem, Statistical inference (point and interval estimation and hypothesis testing) on means, proportions and variances; Power and operating characteristics of tests. Chi-squares test of goodness of fit. Regression analysis. Introduction to design of experiments. *Basis SAS Programming II*: Programming with SAS numeric and character functions. DO groups – simple do, do loops and applications to replace iteration; nested do loops. Joining and merging SAS data sets under different conditions ARRAYS in SAS; applications in performing table-look-ups, rotating data sets, and performing repeated iterations using indexed variables. Accumulating totals – with the RETAIN, SUM and ASSIGNMENT statements BY processing in SAS. **Course Aims:** ➢ Probability and Statistics Fundamentals: BME401 aims to provide students with a solid foundation in probability theory and statistical methods. The course covers key concepts such as probability space, random variables, discrete and continuous distributions, mean, variance, and their practical applications. ➢ Statistical Distributions: The course aims to familiarize students with various probability distributions, including Bernoulli, Binomial, Poisson, hyper-geometric, exponential, and normal distributions. Students will learn about the characteristics and properties of these distributions and their relevance in engineering analytics.	

	➢ Statistical Inference: BME401 covers statistical inference techniques, including point and interval estimation, hypothesis testing, and the determination of power and operating characteristics of statistical tests. Students will learn how to make informed decisions based on sample data and draw conclusions about population parameters. ➢ Regression Analysis: The course introduces students to regression analysis techniques for analyzing relationships between variables. Students will learn how to fit regression models, assess model adequacy, and interpret regression coefficients to make predictions and inferences. ➢ Design of Experiments: BME401 provides an introduction to the design of experiments, including principles of experimental design and analysis of variance (ANOVA). Students will learn how to design experiments to investigate the effects of multiple factors and analyze experimental data to draw meaningful conclusions. ➢ Advanced SAS Programming Techniques: The course builds on the basics of SAS programming introduced in Basis SAS Programming I. Students will learn advanced programming techniques using SAS, including numeric and character functions, DO groups, nested do loops, and array processing. ➢ Data Manipulation and Analysis: BME401 covers data manipulation and analysis using SAS, including joining and merging SAS datasets, working with arrays for efficient data processing, and performing table-look-ups and data transformations. ➢ Accumulating Totals and BY Processing: Students will learn how to use SAS statements such as RETAIN, SUM, and ASSIGNMENT for accumulating totals and processing data BY groups. This includes understanding how to perform repeated iterations using indexed variables and apply BY processing for grouped data analysis. **Learning Outcomes:** Upon completing BME401, students should be able to: ➢ Understand fundamental concepts of probability theory and statistical inference. ➢ Apply various probability distributions to model real-world engineering phenomena. ➢ Perform point and interval estimation, hypothesis testing, and analyze the power of statistical tests. ➢ Conduct regression analysis to examine relationships between variables and make predictions. ➢ Design and analyze experiments to investigate the effects of multiple factors on outcomes. ➢ Apply advanced SAS programming techniques for data manipulation and analysis.	

	➢ Use SAS to perform complex data processing tasks, including joining datasets, working with arrays, and accumulating totals. ➢ Apply statistical and analytical methods to solve engineering problems and make data-driven decisions.	
CEN405	**Assembly Language Programming**	**3 UNITS**
	Introduction: Language level of abstraction and effect on machine, characteristics of machine code, advantages, justifications of machine code programming, instruction set and dependency on underlying processor. Intel 8086 microprocessor assembly language programming: Programming model as resources available to programmer, addressing modes, instruction format, instruction set-arithmetic, logical, string, branching, program control, machine control, input/output, etc; assembler directives, hand assembling, additional 80×86/Pentium instructions. Modular programming. Interrupt and service routine. Interfacing of assembly language to C. intel 80×87 floating point programming. Introduction to MMX and SSE programming. Motorola 680×0 assembly language programming. Extensive practical engineering problems solving in assembly language using MASM for Intel, and cross-assembler for Motorola. **Course Description:** CEN405 Assembly Language Programming introduces students to the fundamental concepts and principles of assembly language programming, focusing on the Intel 8086 microprocessor architecture. The course explores the language level of abstraction and its effects on machine execution, characteristics of machine code, advantages, justifications of machine code programming, instructions, and dependencies on the underlying processor. Furthermore, students are introduced to the interface of assembly language with C programming and the basics of MMX and SSE programming for multimedia applications. **Aim:** The aim of CEN405 Assembly Language Programming is to provide students with a comprehensive understanding of assembly language programming principles, focusing on the Intel 8086 microprocessor architecture, and to equip them with the skills necessary to write efficient and optimized code at the machine level. **Learning Outcomes**: By the end of the course, students will be able to:	

	➢ Understand the language level of abstraction and its impact on machine execution. ➢ Analyze the characteristics of machine code and its relationship with hardware architecture. ➢ Justify the importance and advantages of machine code programming. ➢ Demonstrate proficiency in Intel 8086 microprocessor assembly language programming. ➢ Interface assembly language with C for system-level programming. ➢ Apply MMX and SSE programming techniques for multimedia applications. ➢ Recognize the dependencies between instructions and the underlying processor architecture.	
EEE401	**Control System Engineering I**	**3 UNITS**
	Introduction to control system: Definition, requirements, applications; definition and configuration of control strategies: Open-loop control, Closed-loop control, and Feed-forward control. Laplace transform, and Dynamic system modeling. Transfer function. Types and representation of input signals. Time domain performance analysis: Steady-state analysis (steady state errors, error constants, system classification), and Transient-state analysis. Routh-Hurwitz absolute system stability criteria. Classification of systems based on steady-state characteristics, steady-state error coefficient. Definition of Root locus, Properties of root locus, sketching of root locus plots. Effect of open-loop zeros and poles. Root locus design concepts. **Frequency response analysis and design:** Bode diagram, Polar plot, Nichols plot. Nyquist stability criterion: non-mathematical description of Nyquist criterion, interpretation of stability. Relative stability - Gain and phase margins. Closed-loop frequency response analysis - M and N contours, Nichols chart. Compensation techniques: lag, lead and lag-lead compensation, PD, PI and PID controllers. Cascade compensation based on root-locus method. Introduction to Feedback compensation. Computer-aided design and analysis of control system. **Course Description:** Basic concepts and examples of control systems; mathematical models of control components/systems such as servo motors, valves,	

	transducers, error detectors, electrical systems, thermal systems, and pneumatic systems. Open and closed loop control systems; Block diagrams and signal flow graphs; PID (three term controller) tuning; transient and steady state response, Synchro- transmitters and receivers. Feedback, Time response analysis, concept of stability, Field-controlled and armature-controlled dc motors. Routh- Hurwits criterion; Root - locus techniques, frequency – response analysis, polar and Bode plots, Nyquist stability criteria. Nicholas chart, use of MATLAB, compensation techniques chart, compensation techniques, introduction to non- linear systems. **Course Aims:** ➢ Fundamental Concepts of Control Systems: EEE401 aims to introduce students to the basic principles and concepts of control systems. Students will learn about the components and mathematical models of control systems, including servo motors, valves, transducers, and various types of systems used in engineering applications. ➢ Open and Closed Loop Control Systems: The course aims to differentiate between open-loop and closed-loop control systems. Students will understand the principles behind open and closed-loop systems, their advantages, disadvantages, and practical applications. ➢ Block Diagrams and Signal Flow Graphs: EEE401 covers the representation of control systems using block diagrams and signal flow graphs. Students will learn how to analyze and interpret these graphical representations to understand the behavior of control systems. ➢ PID Control and Tuning: The course introduces students to PID (Proportional-Integral-Derivative) controllers and tuning methods. Students will learn how to adjust PID controller parameters to achieve desired transient and steady-state responses in control systems. ➢ Time Response Analysis and Stability Concepts: EEE401 covers time response analysis techniques and stability concepts in control systems. Students will learn about transient and steady-state responses, stability criteria, and methods for analyzing the stability of control systems, including Routh-Hurwitz criterion, root locus techniques, and frequency-response analysis. ➢ Frequency Response Analysis: The course provides an introduction to frequency-response analysis techniques, including polar plots and Bode plots. Students will learn how to analyze the frequency response of control systems and assess their stability and performance characteristics. ➢ Use of MATLAB in Control Systems: EEE401 includes practical exercises using MATLAB for control system analysis and design. Students will learn how to use MATLAB to simulate control system behavior, analyze system responses, and design controllers.	

	➢ Introduction to Non-linear Systems and Compensation Techniques: The course briefly introduces students to non-linear systems and compensation techniques. Students will gain an understanding of how to address non-linearities in control systems and apply compensation techniques to improve system performance. **Learning Outcomes:** Upon completing EEE401, students should be able to: ➢ Understand the fundamental concepts and components of control systems. ➢ Differentiate between open-loop and closed-loop control systems and their applications. ➢ Analyze control systems using block diagrams and signal flow graphs. ➢ Design and tune PID controllers to achieve desired system responses. ➢ Perform time response analysis and assess system stability using stability criteria. ➢ Analyze frequency response using polar and Bode plots and understand system performance. ➢ Utilize MATLAB for control system simulation, analysis, and design. ➢ Apply compensation techniques to improve the performance of control systems, including those with non-linear behavior. ➢ By achieving these learning outcomes, students will develop the necessary skills and knowledge to analyze, design, and optimize control systems for various engineering applications.	
EEE403	**Digital Electronics**	**3 UNITS**
	Introduction: Digital vs analogue systems, digital system design hierarchy, stored program digital computer organization, logic devices-TTL and CMOS families. Number systems and codes: Positional notation, number systems, binary arithmetic, octal arithmetic, hexadecimal arithmetic, base conversions, signed number representation, computer codes. Analysis & Synthesis of Logic circuits: Boolean algebra, basic postulates and theorems, switching functions, truth tables, derivation of canonical forms, switching circuits, gates, basic functional components, analysis of combinational circuits, AND-OR and NAND networks, OR-AND and NOR networks, two level circuits, AND-OR-inverter circuits, computer aided design of logic circuits. Switching function simplification: Characteristics of minimization methods, Karnaugh maps, K-maps of four or more	

variables, function plotting, simplification by K-maps, derivation of minimal sum of product, and minimal product of sum form by K-maps. Quine-McCluskey tabular minimization method, computer aided minimization, prime implicants determination methods. Introduction to sequential circuits: Models, and block diagram representation. State tables and diagrams. Memory devices. Latches: SR-latch, gated SR-latch, delay latch. Flip-Flop: Master-slave SR-FFs, D-FFs, JK-FFs; edge triggered D-FF, JK-FFs; T-FFs. Timing circuits. Modular combinational circuits: Modular design, decoder circuits and structures, logic function using decoders, encoders, multiplexers/data selectors, de-multiplexers and applications. Binary arithmetic elements, binary adder and subtraction circuits, comparators. Design examples. Computer ALU, and computer aided design of modular systems.

Course Description:
EEE403 Digital Electronics covers fundamental concepts and principles in digital systems, digital logic design, and computer organization. Students delve into the distinction between digital and analog systems, study the design hierarchy of digital systems, explore stored program digital computer organization, and examine logic devices such as TTL and CMOS families. The course also includes an in-depth exploration of number systems and codes, analysis and synthesis of logic circuits, Boolean algebra, switching function simplification, and the design of various flip-flops including SR, D, and JK flip-flops. Additionally, students learn to design a computer Arithmetic Logic Unit (ALU).

Course Aim:
The aim of EEE403 Digital Electronics is to provide students with a comprehensive understanding of digital systems, enabling them to analyze, design, and implement digital circuits and systems. Through theoretical learning and practical applications, students will gain proficiency in digital logic design, computer organization, and the utilization of logic devices. The course aims to equip students with the necessary skills to design and optimize digital circuits, thereby laying a solid foundation for advanced studies and professional practice in the field of electrical and computer engineering.

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

- Differentiate between digital and analog systems, and comprehend their respective characteristics, advantages, and limitations.
- Understand the design hierarchy of digital systems and apply hierarchical design principles in practical circuit design.

	➢ Analyze and evaluate the organization of stored program digital computers, including memory structures and instruction execution. ➢ Identify and characterize logic devices from TTL and CMOS families, and select appropriate devices for specific digital circuit applications. ➢ Demonstrate proficiency in various number systems and codes, including binary, hexadecimal, and octal, and perform arithmetic operations in these systems. ➢ Analyze and synthesize logic circuits using Boolean algebra and apply simplification techniques to optimize circuit complexity. ➢ Design and implement state-stable circuits such as SR latch, D flip-flops, SR flip-flops, and JK flip-flops for sequential logic applications. ➢ Design a computer Arithmetic Logic Unit (ALU) incorporating various arithmetic and logic operations, and understand its role in digital computing. ➢ Apply theoretical concepts to practical digital circuit design problems, and utilize simulation tools and prototyping techniques for circuit validation and testing. ➢ Communicate effectively and collaborate with peers in the analysis, design, and presentation of digital electronics projects and assignments.	
EEE405	**Electric Power Principles**	**2 UNITS**
	Introduction to power systems: structure of electric power system, load characteristics, electric power transmission and distribution. Properties of three- phase systems: balanced and unbalanced delta and wye connected loads. Delta- wye transmission. User of symmetrical component method to solve unbalanced three- phase networks. Energy sources: principle and method of energy conversion employing steams, gas, water, nuclear and wind and magneto- hydrodynamic generation. Solar energy and other renewable energy. Components of power generating system prime mover systems, generator, characteristics, equivalent circuit, control and operation. Voltage regulation. Design and organization of power stations: siting of power station auxiliaries. Power system equivalent, standard and safety. **Course Description:** *Generation of Electric Energy*: Sources of energy. Heat value of fuels, Thermal stations, Hydroelectric stations, Nuclear stations. *Economics of Power Supply*: Fixed and running charges in electric power production. Load curves and load duration curves including concept of base, intermediate and peak load. Definition of load factor,	

	maximum demand, Diversity factor and their effects on generation. *Distribution System*: Survey of power system components, feeders, distribution networks: radial and ring networks. Voltage drops in distribution systems (AC and DC systems). Per-unit qualities. *Overhead Transmission System*: Conductors and insulators. Transmission line parameters. Resistance, inductance and capacitance. Stringing: Calculation of sag and tension. Stringing chart and performance. Representation of short and long power lines. *Underground Cables*: Types. Inductance of concentric cables. Capacitance of single-core and three-core cables. Thermal characteristics and sheath currents. **Course Aims:** ➢ Generation of Electric Energy: EEE405 aims to provide students with an understanding of the various sources of electric energy generation, including thermal stations, hydroelectric stations, and nuclear stations. The course explores the heat value of fuels and the economic aspects of power generation. ➢ Economics of Power Supply: Students will learn about the fixed and running charges associated with electric power production. Load curves, load duration curves, and concepts such as base load, intermediate load, and peak load will be discussed. Additionally, the course covers load factor, maximum demand, diversity factor, and their impacts on power generation. ➢ Distribution System: The course provides a survey of power system components and distribution networks, including feeders and radial/ring networks. Students will study voltage drops in distribution systems (AC and DC) and learn about per-unit quantities used in power system analysis. ➢ Overhead Transmission System: Topics include conductors and insulators used in overhead transmission lines, transmission line parameters such as resistance, inductance, and capacitance, and calculations related to sag and tension in transmission lines. Students will explore the performance and representation of short and long power lines. ➢ Underground Cables: Students will gain an understanding of underground cable types, including their thermal characteristics and sheath currents. Inductance and capacitance of single-core and three-core cables will be discussed, along with their implications for power transmission. **Learning Outcomes:** Upon completing EEE405, students should be able to: ➢ Describe the various sources of electric energy generation and analyze the economics of power supply, including fixed and running charges. ➢ Interpret load curves, load duration curves, and understand the concepts of base load, intermediate load, peak load, load factor, maximum demand, and diversity factor.	

	➢ Analyze distribution systems, including the components and configurations of feeders and distribution networks. ➢ Calculate voltage drops in distribution systems and apply per-unit quantities in power system analysis. ➢ Explain the characteristics of overhead transmission systems, including conductors, insulators, and transmission line parameters. ➢ Calculate sag and tension in overhead transmission lines and understand the performance of short and long power lines. ➢ Evaluate the characteristics and applications of underground cables, including thermal characteristics and sheath currents, and analyze inductance and capacitance effects. ➢ Through theoretical study, practical examples, and case studies, students will develop the skills and knowledge necessary to analyze, design, and operate electrical power systems effectively and efficiently in various applications.	
EEE411	**Electrical and Electronics Lab. III**	**3 UNITS**
	A laboratory work set up to demonstrate topics covered in control theory, communication principles, electronic engineering, computer techniques and electric power principles **Course Description:** EEE411 is a practical laboratory course designed to complement theoretical knowledge in communication principles, electrical power principles, and power electronics. Students will engage in hands-on experiments and projects to reinforce their understanding of key concepts and principles covered in these areas. **Course Objectives:** Communication Principles: Apply theoretical concepts of communication principles to practical scenarios. Explore the characteristics and behavior of communication systems through practical experiments. Gain proficiency in using communication equipment and instruments. Electrical Power Principles: Perform experiments related to electrical power generation, transmission, and distribution. Analyze the behavior of electrical machines and power systems under different operating conditions. Understand the principles of power measurement and analysis. Power Electronics:	

	Design and implement power electronic circuits for various applications. Investigate the performance of power electronic devices such as diodes, thyristors, and transistors. Study the principles of power conversion and control through practical experimentation. **Learning Outcomes:** By the end of the course, students should be able to: ➢ Demonstrate a practical understanding of communication principles and systems. ➢ Analyze electrical power systems and machines through laboratory experiments. ➢ Design and implement power electronic circuits for specific applications. ➢ Use laboratory equipment and instruments effectively to conduct experiments and measurements. ➢ Interpret experimental data, draw conclusions, and make recommendations based on experimental results.	
EEE409	**Engineering Computational Method**	
	Roots of polynomials: method soft bisection, Newton, Bairstow, synthetic division and Lehmer; Direct methods of the solution of linear equations; Gaussian elimination, triangulation and iterative methods. Solution of non-linear equations: Newton- Raphson's, Bairstow's, Aitken and iterative solution techniques. Synthetic division and Lamar. Numerical integration and differentiation: Newton cotes formulae and finites difference methods; the eigenvalue problem: characteristics polynomial, the power method, Givens and Householder methods. Numerical solution of ordinary differential equations- methods of Taylor, Euler predictor-corrector and Runge-Kutta **Course Description:** EEE409 Engineering Computational Methods is a comprehensive course designed to equip students with fundamental numerical techniques and algorithms essential for solving engineering problems. The course covers various topics including roots of polynomials, numerical methods for solving nonlinear equations, direct and iterative methods for solving linear equations, interpolation, numerical differentiation and integration, and ordinary differential equations (ODEs) solving methods. Students will engage in theoretical discussions, algorithmic implementations, and practical	

	applications to enhance their problem-solving skills in engineering contexts. **Aim:** The aim of EEE409 Engineering Computational Methods is to provide students with a solid foundation in numerical techniques and algorithms essential for solving engineering problems encountered in diverse fields. Through theoretical understanding, algorithmic implementations, and practical applications, students will develop proficiency in employing computational methods to analyze, model, and solve complex engineering problems accurately and efficiently. **Learning Outcomes:** By the end of the course, students should be able to: ➢ Understand and Apply Numerical Methods: Demonstrate a deep understanding of numerical techniques such as the method of bisection, Newton-Raphson method, Bairstow's method, synthetic division, Lehmer's method, direct methods for solving linear equations (e.g., Gaussian elimination), and iterative methods. ➢ Solve Polynomial Equations: Determine the roots of polynomials accurately using various methods including Bairstow's method, synthetic division, and Lehmer's method. ➢ Solve Linear Equations: Apply direct methods such as Gaussian elimination and iterative methods to efficiently solve systems of linear equations arising in engineering problems. ➢ Interpolate and Approximate Functions: Employ interpolation techniques to approximate functions and data sets accurately, using methods such as Newton interpolation, Lagrange interpolation, and cubic splines. ➢ Solve Ordinary Differential Equations (ODEs): Understand and implement numerical techniques for solving ordinary differential equations, including Euler's method, predictor-corrector methods, and Runge-Kutta methods. ➢ Evaluate Error Analysis: Analyze the sources of error in numerical computations and apply appropriate techniques to minimize and control error propagation. ➢ Implement Algorithms: Develop proficiency in implementing numerical algorithms using computational tools such as MATLAB, Python, or similar programming languages. ➢ Apply Computational Methods in Engineering Contexts: Apply numerical techniques and algorithms to solve real-world engineering problems, demonstrating the ability to model, analyze, and interpret engineering systems and phenomena accurately and effectively.	
MTE401	**Automation and Robotics I**	**3 UNITS**

	Automation and Robotics. Robot Classification. Robot Specifications. Direct Kinematics: Mathematical background. D-H representation. The Arm equation. Examples Inverse Kinematics: The inverse kinematics problem and its solution. Tool configuration. Examples of various robots. Introduction to Manipulator Dynamics: Lagrange's Equation, Lagrange-Euler Dynamic Model. Use of Sensors and Vision System in Robotic System. Introduction to automation: Economics of Automation, Flow Lines, Mathematical Models, Storage Buffers, Partial Automation, Balancing, Group Technology and Flexible Manufacturing. 30 Hours Lecture; 45 Hours Practical **Course Description:** MTE401 Automation and Robotics I is an introductory course designed to provide students with a comprehensive understanding of automation and robotics principles. The course covers various aspects such as robot classification, specifications, kinematics, dynamics, sensor utilization, vision systems, and flexible manufacturing. Through theoretical concepts, mathematical representations, and practical examples, students will explore the fundamental principles underlying the design, operation, and control of robotic systems. **Aim:** The aim of MTE401 Automation and Robotics I is to equip students with the essential knowledge and skills required to understand, analyze, and design robotic systems. By delving into topics such as robot classification, kinematics, dynamics, sensor integration, and automation techniques, the course aims to foster a deep understanding of the theoretical foundations and practical applications of robotics technology. **Learning Outcomes:** Upon successful completion of the course, students will be able to: ➢ Understand Robot Classification: Classify different types of robots based on their kinematic structures, degrees of freedom, and application domains. ➢ Analyze Robot Specifications: Interpret and evaluate robot specifications including payload capacity, speed, accuracy, and repeatability to select appropriate robots for specific tasks. ➢ Apply Kinematic Concepts: Utilize direct kinematics and Denavit-Hartenberg (D-H) representation to describe the spatial configuration and motion of robotic manipulators.	

	➢ Solve Inverse Kinematics Problems: Apply mathematical methods and algorithms to determine the joint configurations required to achieve desired end-effector positions and orientations. ➢ Examine Manipulator Dynamics: Analyze manipulator dynamics using the Lagrange equation to model and understand the motion and behavior of robotic systems. ➢ Integrate Sensors and Vision Systems: Explore the use of sensors and vision systems for perception, feedback, and control in robotics applications. ➢ Implement Flexible Manufacturing Concepts: Understand the principles of flexible manufacturing, including flow lines, buffers, partial automation, and balancing, for efficient and adaptable production processes. ➢ Demonstrate Practical Applications: Apply theoretical concepts to real-world examples and hands-on projects to design, control, and optimize robotic systems for various industrial and research applications.	
MEE409	**Engineering Economics & Accounting**	**2 UNITS**
	Introduction to economics. Economic evaluations. Industry and national economic policy. **Economics, Planning and Control:** Resource allocation, budgeting, estimation of expenditure, capital investment, control of costs and finance. **Costing and Finance:** Marginal or direct costing, policy basis, depreciation and overheads, stock evaluation, cost of making a product. Costing for labour and materials, costing decisions. **Management Accounting**: Basic accounting concepts and practices. Reporting results, difference between budget and forecast, profit and loss, sales, capital, cash flow. 30 Hours Lecture **Course Description:** MEE409 Engineering Economics & Accounting provides an overview of key economic principles and accounting practices relevant to engineering and management contexts. The course explores economic evaluations, industry and national economic policies, as well as economic planning and control mechanisms. Additionally, it covers costing and finance principles, management accounting techniques, and reporting methodologies necessary for effective decision-making in engineering enterprises. **Aim:**	

	The aim of MEE409 Engineering Economics & Accounting is to equip students with a comprehensive understanding of economic theories, accounting principles, and financial management techniques essential for making informed decisions in engineering projects and enterprises. By integrating economic concepts with accounting practices, the course aims to develop students' ability to analyze, evaluate, and manage financial resources efficiently within engineering contexts. **Learning Outcomes:** By the end of the course, students should be able to: ➢ Understand fundamental economic principles and their application in engineering decision-making processes. ➢ Evaluate industry and national economic policies and their implications for engineering projects and enterprises. ➢ Apply economic planning and control techniques to effectively allocate resources, budget expenditures, and manage capital investments. ➢ Analyze and interpret costing and finance principles, including marginal costing, depreciation, stock evaluation, and cost of production. ➢ Apply management accounting concepts and practices to report financial results, forecast cash flows, and assess profitability in engineering contexts. ➢ Develop critical thinking skills to identify financial risks, optimize resource allocation, and make strategic decisions aligned with organizational objectives. ➢ Communicate financial information effectively to stakeholders, enabling informed decision-making and promoting transparency in engineering enterprises.	
EEE420	**SIWES: Industrial Attachment**	**6 UNITS**
	On the job in industry for industrial experience. **Course Description:** EEE420, the Students Industrial Working Experience Scheme (SIWES), is a mandatory program designed to provide students with practical exposure to real-world engineering practices in related industries. Students are required to spend a minimum of 6 months working in industries relevant to their field of study within the electrical and electronics engineering discipline. During this period, students are supervised by both industry professionals and faculty members from the university. **Course Objectives:** Practical Exposure: Provide students with firsthand experience and exposure to industrial practices, processes, and technologies in the electrical and electronics engineering field.	

	Skill Development: Enhance students' technical skills, problem-solving abilities, and critical thinking through hands-on experience in real-world engineering projects and tasks. Industry Insights: Enable students to gain insights into the operations, challenges, and opportunities within the electrical and electronics engineering industry. Professional Development: Cultivate students' professionalism, work ethics, communication skills, and teamwork abilities in a professional work environment. Course Structure: Students are required to secure placements in relevant industries approved by the university. During the 6-month period, students engage in supervised industrial training, where they work on assigned projects and tasks under the guidance of industry mentors. Faculty members from the university conduct periodic visits to the students' placement sites to monitor their progress, provide guidance, and ensure alignment with academic objectives. Students are expected to maintain regular communication with both their industry supervisors and university faculty members throughout the duration of the program. Assessment: Assessment in EEE420 is based on the students' performance during the industrial training period. Evaluation criteria may include: Completion of assigned tasks and projects. Adherence to industry standards and best practices. Professional conduct, punctuality, and work ethics. Submission of periodic reports and documentation of activities. Feedback from industry supervisors and university faculty members.	
CEN503	**Digital Signal Processing**	**3 UNITS**
	Introduction: Definition and components of DSP, application areas with justification of DSP. Discrete time signals & systems: Discrete-time signals, Discrete-time systems, Linear Time-Invariant systems and their properties, Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems. Analytical Tools: Definition of z-transform, Region of Convergence, Properties of z-Transform, Inversion of the z-Transform methods, Analysis of Linear Time-Invariant Systems in the z-Domain. Discrete Fourier Transform and its properties, Inverse Discrete Fourier Transform, Linear Convolution using Discrete Fourier Transform, Fast Fourier Transform, Decimation in time and Decimation in frequency. Short Time Fourier	

transform: principle, characteristics, applications. Wavelet transform: principle, characteristics, and applications. Digital Filter Design: IIR filter design, bilinear z-transform design approach, IIR filter realization, FIR filter design, realization of FIR filter, application examples. Block diagram representation of constant coefficient difference equations, IIR and FIR systems and their basic structures, Stability of discrete time systems. Finite word length effect. Introduction to real-time DSP implementation: Types of DSP- fixed point , and floating point, merits and de-merits, and applications, DSP architecture. Software developments: assembly programs, C programs, mixing C and assembly code, software development tools. Hardware issues: hardware selection, configurations, and hardware tools.

Course Description:
Digital Signal Processing (DSP) is a foundational course focusing on the theory, techniques, and applications of processing digital signals. Topics covered include discrete signal representation, Z-transform, digital Fourier transform, fast Fourier Transform (FFT), filter synthesis, digital filtering, and basic concepts of image processing.

Course Aims:
- Fundamental Concepts of Digital Signal Processing: Introduce students to the fundamental concepts and principles of digital signal processing, including discrete signal representation and transformation techniques.
- Filter Synthesis and Design: Familiarize students with the synthesis and design of digital filters, including low-pass, high-pass, and band-pass filters, using spectral transform methods.
- Digital Filtering Techniques: Explore digital filtering techniques, including recursive and non-recursive filters, and their applications in signal processing and analysis.
- Hardware and Software Realization of Filters: Provide students with an understanding of the hardware and software realization of digital filters, including techniques for implementation in both hardware and software environments.
- Introduction to Image Processing: Introduce students to basic concepts of image processing and the application of digital signal processing techniques in image analysis and manipulation.

Learning Outcomes:
Upon completion of the course, students will be able to:
- Understand the principles of discrete signal representation and transformation, including the Z-transform and digital Fourier transform.

	➢ Apply spectral transform methods for the synthesis and design of digital filters, including low-pass, high-pass, and band-pass filters. ➢ Implement digital filtering techniques, including recursive and non-recursive filters, for signal processing applications. ➢ Realize digital filters in both hardware and software environments, employing computer-based techniques for filter synthesis and implementation. ➢ Apply basic concepts of digital signal processing to image processing tasks, including image filtering and manipulation.	
EEE501	**Design and Installation of Electrical and ICT Services**	**3 UNITS**
	Introduction to Health and safety at work act in Nigeria. Electrical safety. First aid. Electricity supply regulations. NCC and FCCC Telecommunication Codes of Practice. Lighting and Illumination: Design and calculations for different and applications both domestic and industrial. Electrical Installation material selection and rating: Cables, fittings, motors, generators, equipment, etc. Glare, Conduiting, Trucking, and Overhead Installation. Telecommunication Design and Installation: Telephone, PABX, cables, cabling, trucking, calculations, etc. Computer Networking: Design, Calculations, topology, cables, cabling, etc. Satellite and VSAT installation. Surge and lighting protections. Earthing: earth resistivity measurement, surge and lighting equipment selection and installation. Costing and preparation of BEME. Basic Law of Contract. Commissioning 30 hours **Course Description:** EEE501 Design and Installation of Electrical and ICT Services provides students with a comprehensive understanding of the principles, regulations, and practices involved in designing and installing electrical and information and communication technology (ICT) services. The course covers various topics, including health and safety regulations, electrical safety, first aid, electricity supply regulations, telecommunications codes of practice, lighting and illumination, and design and calculations for different appliances. Additionally, students will learn about electrical installation material selection and rating, telecommunication design and installation, computer network installation, and the costing and preparation of Bill of Engineering Measurement and Evaluation (BEME). Through theoretical instruction, practical demonstrations, and hands-on experience, students will develop the skills and knowledge necessary	

	to design, install, and maintain electrical and ICT systems in compliance with industry standards and regulations. **Aim:** The aim of EEE501 is to equip students with the technical knowledge, practical skills, and regulatory understanding required to design and install electrical and ICT services safely and effectively. By exploring key concepts and practices related to electrical and ICT systems, the course aims to prepare students for careers in electrical engineering, telecommunications, information technology, and related fields. Through a combination of theoretical instruction, laboratory exercises, and real-world projects, students will develop the competencies necessary to contribute to the design, installation, and maintenance of modern electrical and ICT infrastructure. **Learning Outcomes:** Upon successful completion of EEE501, students will be able to: ➢ Demonstrate an understanding of health and safety regulations applicable to electrical and ICT work in Nigeria, including the Health and Safety at Work Act. ➢ Identify and implement electrical safety measures to prevent accidents, injuries, and electrical hazards in the workplace. ➢ Apply first aid principles and procedures to respond effectively to emergencies and accidents related to electrical and ICT installations. ➢ Interpret and comply with electricity supply regulations, as well as telecommunications codes of practice and standards set by regulatory bodies such as the Nigerian Communications Commission (NCC) and the Federal Competition and Consumer Protection Commission (FCCPC). ➢ Design lighting and illumination systems for different applications, considering factors such as efficiency, aesthetics, and user comfort. ➢ Perform design and calculations for various electrical appliances, including motors, generators, and other equipment, considering load requirements and efficiency. ➢ Select and specify appropriate electrical installation materials, such as cables, fittings, conduits, trunking, and overhead installations, based on performance, durability, and safety standards. ➢ Design and install telecommunication systems, including telephone, private automatic branch exchange (PABX), cables, cabling, trunking, and conduct calculations for efficient operation. ➢ Plan and implement computer network installations, considering factors such as network topology, cable types, and data transmission requirements. ➢ Prepare accurate cost estimates and Bills of Engineering Measurement and Evaluation (BEME) for electrical and ICT projects, considering material costs, labor, and other expenses.	

EEE502	**Engineering Law**	**3 UNITS**
	Law: Ethics and conduct in engineering, legal definitions and specifications, application of business law to engineering, patents and inventions, trademark and copyrights contracts and contract documents, engineering business, types, the structure and functions of organizations, professional problems – legal responsibilities professional liability, role of engineer in law suits. Management: Organizational structure and behaviors, engineer to engineer manager transition, managerial functions, principles and techniques of planning forecasting, organizing technical activities, project selection and management, style of leadership and management techniques. Concepts; Definitions and functions of law; basic structure of Nigerian Law; law of engineering; principles of law involving contracts and contract documents, patents, and inventions, copyrights, trademarks, property; industrial labour law; legislation on wages, trade unions and industrial accidents; land acquisition, environmental laws, legal aspects of professional engineering; responsibilities and liabilities. Introduction to Industrial `relations; Design of Management Strategy in an Industry; Engineering management techniques, in production, processing, construction, sourcing, etc. **Course Aims:** ➢ To Familiarize Students with Legal Frameworks: Introduce students to the fundamental concepts, definitions, and functions of law, with a specific focus on Nigerian legal structures and their applications in the field of engineering. ➢ To Develop Understanding of Legal and Regulatory Compliance: Equip students with knowledge regarding laws governing engineering practices including contracts, patents, copyrights, trademarks, property rights, industrial labor laws, environmental regulations, and professional engineering responsibilities and liabilities. ➢ To Enhance Management Skills: Provide students with insights into the design and implementation of effective management strategies within engineering industries, focusing on production, processing, construction, sourcing, and industrial relations. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Understand Legal Foundations: Demonstrate a clear understanding of the basic concepts, definitions, and functions of law, particularly as they pertain to engineering practices, within the context of Nigerian legal structures.	

	➢ Comprehend Legal Principles: Interpret and apply legal principles related to contracts, contract documents, patents, inventions, copyrights, trademarks, property rights, industrial labor laws, and environmental regulations in engineering scenarios. ➢ Navigate Regulatory Compliance: Identify and comply with relevant legal and regulatory requirements governing engineering activities, including those related to wages, trade unions, industrial accidents, land acquisition, and environmental protection. ➢ Evaluate Professional Responsibilities and Liabilities: Assess and analyze the ethical and legal responsibilities and liabilities associated with professional engineering practice, including obligations towards clients, employers, and the broader society. ➢ Develop Management Strategies: Design and implement effective management strategies tailored to the unique requirements of engineering industries, encompassing production, processing, construction, sourcing, and industrial relations. ➢ Apply Engineering Management Techniques: Apply engineering management techniques to optimize operational processes, enhance productivity, mitigate risks, and promote sustainable development within industrial settings. ➢ Communicate Effectively: Communicate legal and management concepts clearly and effectively, both orally and in writing, demonstrating proficiency in articulating complex ideas and principles related to engineering law and management. ➢ Collaborate and Problem-Solve: Collaborate with peers to analyze real-world legal and management challenges encountered in engineering practice, propose innovative solutions, and engage in critical thinking and problem-solving exercises. By achieving these learning outcomes, students will be well-prepared to navigate the legal and managerial complexities inherent in engineering professions, ensuring ethical conduct, regulatory compliance, and effective leadership in various industrial contexts.	
EEE503	**Control Systems Engineering II**	**3 UNITS**
	Relative stability concepts. Root Locus Analysis: Introduction, Root Locus plots, general rules for constructing root- Locus. Root- Locus plots with MATLAB, Root-Lab, Root- Locus analysis of control systems and root contour plots. Control systems Design by Root-Locus method; preliminary design consideration, lead, lag and lead- lag compensation. Frequency response analysis: Bode diagrams, plotting of Bode [diagrams with MATLAB, Polar plots, Nyquist stability criterion, drawing of Nyquist plots with MATLAB, Log- Magnitude	

versus phase plots. Stability analysis. Closed loop frequency response. Experimental determination of transfer functions. Control systems Design by frequency Response: introduction, lead, lag and lead- lag compensation. PID control and introduction to robust control: Tuning rules for PID controllers. Modification of PID control schemes. Two degree- of- freedom control. Design consideration for robust control.

Course Description:
Control System II is an advanced course that builds upon the foundational concepts of control systems. It delves into state space descriptions, controllability, observability, state feedback, and model control observers. Additionally, it covers topics such as relay control systems, describing function techniques, calculus of variations, system identification, Kalman filters, and least square error controllers. The course also explores numerical controllers, Z-transforms, pulse transfer functions, stability analysis in discrete systems, root locus analysis, frequency domain analysis, and computer software-based solutions.

Course Aims:

- Advanced Understanding of State Space Descriptions: Enable students to comprehend and utilize state space descriptions for linear systems, including concepts of controllability and observability.
- Application of State Feedback and Model Control Observers: Provide students with the knowledge and skills to apply state feedback and model control observers in control system design and analysis.
- Understanding Relay Control Systems and Describing Function Techniques: Familiarize students with relay control systems and describing function techniques for analyzing nonlinear systems.
- Introduction to Calculus of Variations and System Identification: Introduce students to calculus of variations and system identification techniques for dynamic system modeling and parameter estimation.
- Exploration of Z-Transforms and Pulse Transfer Functions: Enable students to understand the definition, properties, and applications of Z-transforms, as well as pulse transfer functions for discrete-time systems.
- Stability Analysis in Discrete Systems: Equip students with the skills to analyze stability in discrete systems using methods such as Routh's method, Jury's methods, and Raible's method.
- Comprehensive Understanding of Time Domain and Frequency Domain Analysis: Provide students with a comprehensive understanding of time domain analysis, root locus analysis, and frequency domain analysis for system design and performance evaluation.
- Utilization of Computer Software and SPICE: Familiarize students with the use of computer software, including SPICE and

	LabVIEW Analyzer software packages, for simulation, analysis, and design of control systems. ➢ Introduction to Describing Function Principles and Phase Plane Analysis: Introduce students to describing function principles, phase plane analysis, and Lyapunov functions for stability analysis of nonlinear systems. ➢ Application of Microprocessors to Control Systems: Enable students to apply microprocessors and digital control algorithms in real-world control system applications. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Describe linear systems using state space representations and analyze their controllability and observability. ➢ Design and implement state feedback and model control observers for dynamic systems. ➢ Analyze nonlinear systems using relay control systems and describing function techniques. ➢ Apply calculus of variations and system identification methods for dynamic system modeling and parameter estimation. ➢ Utilize Z-transforms and pulse transfer functions for analysis and design of discrete-time systems. ➢ Analyze stability in discrete systems using various stability analysis methods. ➢ Perform time domain, root locus, and frequency domain analysis for system design and performance evaluation. ➢ Use computer software tools such as SPICE and LabVIEW Analyzer for simulation and analysis of control systems. ➢ Apply describing function principles, phase plane analysis, and Lyapunov functions for stability analysis of nonlinear systems. ➢ Implement microprocessors and digital control algorithms in real-world control system applications. By achieving these learning outcomes, students will be well-equipped with advanced knowledge and skills in control system analysis, design, and implementation, enabling them to tackle complex engineering challenges in various industries.	
EEE504	**Energy Conversion and Storage**	**3 UNITS**
	Introduction: Magnetic circuits, flux linkage, induction and field energy. Properties of magnetic materials: magnetization, hysteresis and eddy current loss. Principle of electromechanical energy conversion. Three Phase Circuits: Polyphase systems. Analysis of balanced three-phase circuits. Y-Δ transformation, power and reactive power calculations. Transformers: Construction, principle of operation and equivalent circuit, phasor diagram, efficiency and regulation. Short and open circuit tests. Parallel operation. Three phase transformers:	

	Construction, connections, and parallel operation. Cooling methods. Autotransformers. Instrument transformers. Three phase induction motors. Synchronous machines. DC machines. Induction machines. Special machines: Single-phase synchronous motors: Reluctance motors, hysteresis motors. Servomotors, synchros, stepper motors. Permanent magnet motors and brushless motors. Amplidyne and metadyne. Universal motors. Printed circuit board motors and switched reluctance motors. **Course Description:** EEE504 Energy Conversion and Storage provides students with a comprehensive understanding of the principles, mechanisms, and technologies involved in the conversion and storage of electrical energy. The course covers various topics including magnetic circuits, flux linkage, electromagnetic induction, properties of magnetic materials, electromechanical energy conversion principles, three-phase circuits, transformer operation and analysis, and the operation of DC and synchronous machines. Through theoretical discussions, practical demonstrations, and hands-on exercises, students will gain insights into the design, operation, and optimization of energy conversion systems for various applications. **Aim:** The aim of EEE504 is to equip students with the knowledge and skills necessary to understand, analyze, and design systems for the conversion and storage of electrical energy. By exploring fundamental principles and advanced technologies in energy conversion, the course aims to prepare students for careers in electrical engineering, renewable energy, power systems, and related fields. Through theoretical instruction, laboratory experiments, and project work, students will develop the expertise to contribute to the development of efficient, sustainable, and reliable energy systems. **Learning Outcomes:** Upon successful completion of EEE504, students will be able to: ➢ Explain the concepts of magnetic circuits, flux linkage, and electromagnetic induction, and apply them to analyze and design electromagnetic devices. ➢ Analyze the properties of magnetic materials, including magnetization, hysteresis, and eddy current losses, and their impact on device performance. ➢ Describe the principles of electromechanical energy conversion and apply them to the design and operation of electrical machines. ➢ Analyze balanced three-phase circuits, including star-delta transformations, power calculations, and reactive power considerations. ➢ Explain the construction and operation of transformers, including equivalent circuits, phasor diagrams, efficiency, and regulation.	

	➢ Analyze the construction, operation, and performance characteristics of DC machines, including generators and motors. ➢ Analyze the construction, operation, and performance characteristics of synchronous machines, including generators and motors. ➢ Design and conduct experiments to evaluate the performance of energy conversion systems and components, and analyze experimental data to draw conclusions. ➢ Apply computational tools and software for the analysis and simulation of energy conversion systems and processes. ➢ Communicate effectively and professionally, both orally and in writing, on topics related to energy conversion and storage	
EEE505	**Seminar**	**1 UNITS**
	Each student must present at least one seminar in a semester and be present at all Engineering seminars within the Department. Each student's seminar topic must be related to the student's final year project and shall be assessed by oral presentation and defense **Course Description:** EEE505 Seminar is a capstone course designed for final year engineering students to showcase their research, project work, and presentation skills. Each student is required to present at least one seminar during the semester, focusing on a topic related to their final year project. Additionally, students are expected to attend and participate in all engineering seminars within the department. Assessment is based on the oral presentation and defense of the seminar topic, providing students with an opportunity to demonstrate their knowledge, communication abilities, and critical thinking skills. **Aim:** The aim of EEE505 Seminar is to provide final year engineering students with a platform to present and defend their research findings, project work, and innovative ideas. By engaging in seminar presentations and attending departmental seminars, students will develop confidence in public speaking, hone their presentation skills, and gain valuable feedback from peers and faculty members. The course aims to foster a culture of scholarly inquiry, collaboration, and intellectual exchange within the engineering community. **Learning Outcomes:** ➢ Upon successful completion of EEE505 Seminar, students will be able to: ➢ Develop and deliver effective oral presentations on topics related to their final year project, demonstrating clarity, coherence, and professionalism. ➢ Defend their seminar topic and respond to questions and critiques from faculty members and peers, showcasing their ability to think critically and articulate their research findings.	

	➢ Apply effective communication strategies to engage and inform the audience, including the use of visual aids, storytelling techniques, and interactive elements. ➢ Demonstrate knowledge and expertise in their chosen seminar topic, drawing upon relevant literature, theoretical frameworks, and practical insights. ➢ Collaborate with peers and provide constructive feedback during seminar presentations, fostering a supportive and intellectually stimulating learning environment. ➢ Analyze and synthesize complex engineering concepts, methodologies, and results, effectively translating technical information for a diverse audience. ➢ Reflect on their seminar presentation experience and identify areas for improvement in public speaking, presentation design, and research communication. ➢ Engage with diverse perspectives, ideas, and approaches presented in departmental seminars, enhancing their understanding of contemporary issues and trends in engineering. ➢ Showcase their research and project work to potential employers, industry professionals, and academic colleagues, enhancing their visibility and credibility within the engineering community. ➢ Demonstrate professionalism, integrity, and respect for intellectual property rights in the presentation and dissemination of their seminar topics and final year project findings.	
EEE506	**Embedded System Design and Programming**	**2 UNITS**
	Introduction to embedded system, components, characteristics, applications. Intel 8051/8031 Micro-controller: Features of the 8051/8031 family, block diagram and definitions of the pin of the 8051, I/O port structure, memory organization: general purpose RAM, bit addressable RAM, register bank, special function registers, external memory, memory space mapping and decoding, bus control signals timing, a typical 8051 micro-controller-based system. Instruction set and assembly Language Programming: Addressing modes, the 8051-instruction set and typical examples, assembler operation, assembly language format, assembler directives, operation of assemblers and linkers, programming examples. On-chip Peripheral Devices: I/O PORTS, OPERATIONS and uses of port 0, port 1, port 2, port 3, timers: their operations programming, and applications, serial port interrupt. Interfacing to external memory, keypad, seven-segment LED display, ADC and DAC chips, and input/output port expansion, description and uses of hardware development tools. MOTOROLLA M6811 Micro-	

	controller: features of M6811, family, block diagram and definitions of the pin of the M6811, I/O port structure, memory organization: general purpose RAM, bit addressable RAM, register bank, special function registers, external memory, memory space mapping and decoding, bus control signals timing. Instruction Set and Assembly Language Programming. On-chip peripheral devices and I/O interfacing. Introduction to PIC microcontrollers: general architecture, applications and selection of microcontroller, advantages, low-end, and high-performance PIC. Specific PIC controllers: Features, architecture, block diagram, pin configuration, on-chip memory, and peripheral. Instruction set and Assemble Language Programming. Serial I/O interfacing: 12C, and SPI interfacing and programing, Memory interfacing: external memory interfacing, EEPROM and Flash memory interfacing. Design exercises using development system. **Course Description:** EEE506 Embedded System Design and Programming offers students a comprehensive exploration of embedded systems, focusing on the fundamental principles, components, characteristics, and applications. The course delves into the features of popular microcontrollers such as the Intel 8051/8031, Motorolla M6811, and PIC microcontrollers, providing insights into their architecture, block diagrams, pin definitions, and memory organization. Additionally, students will learn about various interfacing techniques, including LED display, ADC and DAC chips, I/O expansion, EEPROM, and flash memory, as well as communication protocols such as I2C and SPI. The course also covers assembly language programming for embedded systems, enabling students to develop practical skills in designing and programming embedded systems for diverse applications. **Aim:** The aim of EEE506 is to equip students with the knowledge, skills, and practical experience necessary to design, develop, and program embedded systems for real-world applications. By studying the principles and techniques of embedded system design and programming, students will gain a deeper understanding of hardware-software integration, system architecture, and interfacing technologies, enabling them to tackle complex engineering challenges in various industries. **Learning Outcomes:** Upon successful completion of EEE506, students will be able to: ➢ Define and describe the concept of embedded systems, including their components, characteristics, and applications in diverse	

	fields such as automotive, industrial automation, consumer electronics, and healthcare. ➢ Identify the features and specifications of popular microcontrollers, including the Intel 8051/8031, Motorolla M6811, and PIC microcontrollers, and analyze their architecture, block diagrams, and pin definitions. ➢ Explain memory organization, mapping, and decoding techniques in embedded systems, and demonstrate proficiency in addressing I/O, RAM, and bit-level operations. ➢ Implement interfacing techniques for peripheral devices such as LED displays, ADC and DAC chips, I/O expansion modules, EEPROM, and flash memory, using appropriate hardware and software protocols. ➢ Describe and apply communication protocols such as I2C and SPI for data transfer between embedded systems and external devices. ➢ Develop assembly language programs for embedded systems, including tasks such as data manipulation, control logic, and interfacing with peripherals. ➢ Design and implement embedded system projects that address specific engineering challenges or application requirements, demonstrating creativity, problem-solving skills, and technical proficiency. ➢ Analyze and troubleshoot embedded systems, identifying and resolving hardware and software issues to ensure system reliability, performance, and functionality. ➢ Collaborate effectively with team members to plan, execute, and evaluate embedded system projects, demonstrating communication, teamwork, and project management skills. ➢ Reflect on their learning experience and professional development in embedded system design and programming, identifying areas for further study and skill enhancement.	
EEE507	**Engineering Management**	
	Scope of managerial economics, management models, revenue of various forms, production decision, cost of product, profit analysis of firms, pricing techniques, location and localization of industries, industrial growth in Nigeria, the size of a firm, integration and diversification, marketing demand and forecasting, distributive trade in Nigeria, business finance, investment, capital budgeting and management control, government policies and the firm. Management: Organization structure and behaviours, engineer manager transition, managerial functions, principles and techniques of planning forecasting, organizing technical activities, project selection and management, style of leadership and management techniques.	

Course Description:
EEE507 Engineering Management provides students with an in-depth understanding of managerial principles and practices essential for effective leadership in engineering and technology-related organizations. The course covers a wide range of topics, including managerial economics, revenue analysis, production decision-making, cost analysis, profit optimization, pricing strategies, industrial location and growth, marketing management, business finance, investment analysis, capital budgeting, management control, and the impact of government policies on firms. Additionally, the course addresses organizational behavior and structure, focusing on the transition from an engineering role to a managerial position.

Aim:
The aim of EEE507 is to equip engineering students with the knowledge, skills, and tools necessary to effectively manage engineering projects, teams, and organizations. By exploring principles of economics, finance, marketing, and organizational behavior within the context of engineering management, the course aims to prepare students for leadership roles in engineering firms, technology startups, and other related industries. Through theoretical instruction, case studies, and practical exercises, students will develop the competencies required to navigate complex managerial challenges and drive organizational success.

Learning Outcomes:
Upon successful completion of EEE507, students will be able to:

- Analyze and apply concepts of managerial economics to make informed business decisions and optimize organizational performance.
- Utilize management models and tools to analyze revenue streams, production decisions, and profitability of engineering firms.
- Assess costs associated with product development, manufacturing, and distribution, and implement cost-effective strategies to enhance competitiveness.
- Conduct profit analysis and employ pricing techniques to maximize revenue and market share in competitive environments.
- Evaluate factors influencing industrial location and growth in Nigeria, considering economic, social, and environmental factors.
- Analyze marketing demand and forecast future trends to inform strategic decision-making and resource allocation.
- Understand the role of distributive trade in Nigeria's economy and its implications for engineering management.
- Apply principles of business finance to assess investment opportunities, conduct capital budgeting, and manage financial resources effectively.
- Implement management control systems to monitor performance, ensure accountability, and achieve organizational objectives.

	➢ Assess the impact of government policies and regulations on engineering firms and develop strategies to navigate regulatory challenges. ➢ Recognize and adapt to organizational structures and behaviors, facilitating the transition from an engineering role to a managerial position. ➢ Demonstrate effective communication, leadership, and teamwork skills necessary for managing engineering projects and leading cross-functional teams.	
EEE508	**Reliability and Maintainability of System**	**3 UNITS**
	Introduction to reliability, maintainability, reliability specification and metrics. Application to computer hardware system, communication equipment, power systems, electronic components. Basic maintenance types, and procedures of computer and digital communication system. Fault troubleshooting techniques. QoS and time of availability of data communication. Quality control techniques. Design for higher reliability, fault tolerance. Software Reliability: software reliability specification, software reliability Metrics, fault avoidance, fault tolerance, programming for reliability, software safety and hazard analysis. Comparison of hardware and software reliability. Software Quality and Assurance: definition of software quality, software quality factors, quality control, cost of quality, quality assurance. SQA activities, formal technical reviews, software quality metrics, statistical quality assurance. ISO 9000 Requirements and Certification, ISO 9000-3 for software quality process, process documentation, quality audit. Capability Maturity Model: Software Engineering Institute, levels of maturity, key process areas, Comparison between ISO 9000 Standards and CMM. Ensuring Quality and Reliability: verification and validation, measurement tracking and feedback mechanism, total quality management, risk management. **Course Description:** Reliability & Maintainability of Electrical/Electronic Components & Systems is a comprehensive course focusing on the principles and practices related to ensuring the reliability and maintainability of electrical and electronic systems. It covers topics such as reliability theory, reliability testing, fault analysis, design considerations for reliability and maintainability, quality control, maintenance planning, and documentation requirements.	

Course Aims:

- Introduction to Reliability and Availability: Provide students with an understanding of the concepts of reliability, availability, and elementary reliability theory as they apply to electrical and electronic systems.
- Application of Reliability Concepts: Apply reliability theory to analyze and improve the reliability of power systems and electronic components.
- Reliability Testing and Fault Analysis: Familiarize students with the test characteristics of electrical and electronic components and the types of faults that can occur in such systems.
- Designing for Higher Reliability: Teach students design techniques for achieving higher reliability in packaging, mounting, ventilation, and protection from environmental factors such as humidity and dust.
- Quality Control and Production: Explore the functions of quality control and its relationship to production, engineering, purchasing, and sales activities.
- System Reliability Analysis: Apply reliability concepts to the design of electronic, telecommunication, and power engineering systems, including analyzing component modes of failure, failure distributions, and system reliability.
- Maintenance Planning: Introduce students to different types of maintenance, maintenance planning strategies, frequency, and intensity of inspection, optimal replacement/overhaul policies, and design considerations for ease of maintenance.
- Documentation and Instrumentation Requirements: Discuss the documentation requirements and instrumentation necessary for effective maintenance practices.

Learning Outcomes:

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

- Understand and apply the principles of reliability and availability to electrical and electronic systems.
- Analyze and test the reliability of electrical and electronic components, and identify and mitigate different types of faults.
- Design electrical and electronic systems for higher reliability, considering packaging, mounting, ventilation, and environmental protection.
- Implement quality control practices and understand their impact on production and engineering processes.
- Apply reliability concepts to system design, analyzing failure modes, distributions, and overall system reliability.
- Develop maintenance plans, including inspection frequency, optimal replacement policies, and system design considerations for ease of maintenance.
- Understand documentation and instrumentation requirements for effective maintenance practices.

EEE509	**Power System Engineering I**	**2 UNITS**
	Modelling of Power Components: Transmission line, transformers and synchronous machines; single line representation of three-phase systems. Per unit system representation. Power Flow Analysis: Static state power flow equation; solution by Gauss-Siedel, Newton-Raphson, and other methods. Control of voltage, real and reactive power in Power flow problems. Load forecasting: principles; short power term (daily, weekly, quarterly, annual); long term (half decade, decade); methods and applications. Economic operation of power systems: generating systems; power transfer systems. Definition of power systems and relevant terms, fundamental of power system planning and development includes lectures, demonstrations, mini project and laboratory assignments. **Course Description:** EEE509 Power System Engineering I provides students with a comprehensive understanding of the fundamental principles, components, and analysis techniques involved in power system engineering. The course covers the modelling of key power system components such as transmission lines, transformers, and synchronous machines, as well as the single-line representation of three-phase systems. Additionally, students will learn about the per-unit system representation and power flow analysis methods, including the static state power flow equations and solution techniques such as Gauss-Seidel and Newton-Raphson methods. The course also explores the control of voltage, real and reactive power in power flow problems, and principles of load forecasting. Through lectures, demonstrations, mini-projects, laboratory assignments, and practical exercises, students will gain hands-on experience in power system analysis and develop essential skills for power system planning and development. **Aim:** The aim of EEE509 is to equip students with the knowledge, skills, and analytical tools necessary to understand, analyze, and design power systems effectively. By providing a comprehensive overview of power system components, modelling techniques, and power flow analysis methods, the course aims to prepare students for careers in power system engineering, energy management, and related fields. Through theoretical instruction, practical demonstrations, and hands-on experience, students will develop the ability to solve complex power system problems and contribute to the development of efficient, reliable, and sustainable power systems. **Learning Outcomes:**	

	Upon successful completion of EEE509, students will be able to: ➢ Model key power system components, including transmission lines, transformers, and synchronous machines, for analysis and simulation purposes. ➢ Represent three-phase power systems using single-line diagrams and per-unit system representation techniques. ➢ Analyze power flow in power systems using static state power flow equations and solution methods such as Gauss-Seidel and Newton-Raphson. ➢ Control voltage, real power, and reactive power in power flow problems to maintain system stability and reliability. ➢ Apply principles of load forecasting to predict future electricity demand and plan power system operations and expansions accordingly. ➢ Demonstrate proficiency in using software tools and simulation packages for power system analysis and design. ➢ Evaluate the performance of power systems under various operating conditions and contingencies. ➢ Apply critical thinking and problem-solving skills to address challenges and optimize performance in power system engineering. ➢ Collaborate effectively with team members and stakeholders to develop solutions for power system planning and development projects. ➢ Communicate technical concepts and analysis results effectively through written reports, presentations, and discussions.	
EEE510	**Introduction to Smart Power Grid**	**2 UNITS**
	Introduction to the Smart Grid Considerations for a Smart Grid, Key Characteristics of Smart Grid, NIST Model, Functions of a Smart Grid, Smart Grid Elements, Smart Grid Applications Layer. Electric Grid, Overview of the Electric Grid, Traditional Electric Grid Model, New Technologies for the Electric Grid, Smart Grid Control Elements, Functions and Requirements, Types of Elements, the Internet of Things. Communications and Interoperability Requirements, Technologies, Decision Methodologies. Smart Grid Operations, Electric Grid (Power Delivery), SADA (Supervisory Control and Data Acquisition), Functions and Function Architecture, Data and Data Architecture, Process Architecture, Systems and Layers. Smart Grid Control Layer includes lectures, demonstrations, mini project and laboratory assignments. **Course Description:**	

EEE510 Introduction to Smart Power Grid provides students with a comprehensive overview of the principles, technologies, and applications of smart grid systems in modern power distribution networks. The course covers fundamental concepts such as the evolution of the smart grid, key characteristics, and components of smart grids, as well as the NIST model and functions of smart grid systems. Additionally, students will explore the application layer of smart grids, including considerations for integrating emerging technologies such as the Internet of Things (IoT) and Supervisory Control and Data Acquisition (SCADA) systems. Through theoretical instruction, case studies, and practical exercises, students will gain insights into the role of smart grids in enhancing energy efficiency, reliability, and sustainability in power distribution networks.

Aim:

The aim of EEE510 is to provide students with a comprehensive understanding of smart power grid systems and their significance in modern energy infrastructure. By exploring key concepts, technologies, and applications of smart grids, the course aims to prepare students for roles in power engineering, renewable energy, energy management, and related fields. Through theoretical instruction and hands-on experience, students will develop the knowledge and skills necessary to contribute effectively to the design, implementation, and management of smart grid systems.

Learning Outcomes:

Upon successful completion of EEE510, students will be able to:

- Describe the evolution and rationale behind the development of smart grid systems, including the challenges and opportunities associated with modernizing power distribution networks.
- Identify and explain the key characteristics and components of smart grids, including advanced metering infrastructure, distribution automation, and demand response systems.
- Analyze the NIST model and its role in standardizing smart grid technologies and interoperability among different components and systems.
- Evaluate the functions and benefits of smart grid systems, including improved energy efficiency, reliability, and integration of renewable energy sources.
- Discuss the application layer of smart grids, including considerations for integrating emerging technologies such as the Internet of Things (IoT) and Supervisory Control and Data Acquisition (SCADA) systems.
- Explain the overview of the electric grid and the transition towards smarter, more resilient power distribution networks.
- Describe smart grid control elements and their role in monitoring, control, and optimization of power flow and distribution.
- Analyze the role of IoT devices and sensors in collecting and transmitting data for real-time monitoring and management of smart grid systems.

	➢ Evaluate the importance of SCADA systems in providing remote monitoring and control capabilities for critical infrastructure in smart grid environments. ➢ Apply critical thinking and problem-solving skills to address challenges and opportunities in the design, implementation, and operation of smart grid systems.	
EEE511	**POWER ELECTRONICS DEVICE AND APPLICATIONS**	**2 UNITS**
	Switching characteristics of diodes, transistors, thyristors, etc, Application of thyristors and other SCR devices. Analysis of diode circuit with reactive loads, analysis of circuits using transistors as switches, power control circuits, ac-dc converters, characteristics of switching transformers, powers, power semi-conductor device protection, inverters, dc-dc converter examples of power electronic circuits, solar devices. Micro-processor and microcomputer-based systems. Concept of flexible alternating current control system. **Course Description:** Advanced Electronic Circuits is a comprehensive course that delves into the design and analysis of electronic circuits beyond basic principles. It covers topics such as harmonic distortion, DC/AC considerations, power amplifier design, transistor configurations, RF power amplifiers, oscillators, pulse signal circuits, transmission lines, semiconductor transient response, diode periodic pulse circuits, and multivibrators. **Course Aims:** ➢ Understanding of Harmonic Distortion and Performance Efficiency: Enable students to understand the causes and effects of harmonic distortion in electronic circuits and design techniques to improve performance efficiency. ➢ Design of Power Amplifiers: Familiarize students with the design principles of power amplifiers, including considerations for DC/AC performance, push-pull configurations, class A, class B, and class C amplifiers. ➢ RF Power Amplifiers and Oscillators: Introduce students to the design and analysis of RF power amplifiers, oscillators, and frequency-doubling circuits for industrial applications. ➢ Transmission Lines and Semiconductor Transient Response: Provide students with knowledge of transmission line theory, semiconductor transient response, and the behavior of junction and diffusion capacitances. ➢ Diode Periodic Pulse Circuits and Function Generators: Familiarize students with the principles and applications of diode periodic pulse circuits, including function generators, clipping circuits, and pick-off circuits.	

	➢ Multivibrators: Introduce students to multivibrator circuits, their construction, types, and applications in electronic systems. **Learning Outcomes:** Upon completion of the course, students will be able to: ➢ Analyze and mitigate harmonic distortion in electronic circuits to improve overall performance efficiency. ➢ Design power amplifiers using various configurations such as class A, class B, and push-pull configurations, considering distortion load lines and efficiency. ➢ Design RF power amplifiers with an understanding of frequency doubling, distortion considerations, and industrial applications. ➢ Design and analyze oscillators including sinusoidal, LC (tuned anode), tuned-grid oscillators, and RC oscillators for frequency stability and operation. ➢ Analyze transmission lines and understand their behavior in short and artificial conditions. ➢ Analyze semiconductor transient response and its implications in electronic circuit design. ➢ Design and analyze diode periodic pulse circuits for function generation, clipping, and pulse formation. ➢ Design and analyze multivibrator circuits for various applications in electronic systems. By achieving these learning outcomes, students will develop advanced skills in electronic circuit design, analysis, and troubleshooting, preparing them for careers in electronics engineering, research, and development. They will be able to contribute effectively to the design and implementation of electronic systems in various industries.	
EEE512	**Power System Engineering II**	**2 UNITS**
	Fault Analysis: symmetrical component, symmetrical and unsymmetrical faults analysis. Power System Stability Students: Dynamics of a synchronous machine, power angle equation, steady state stability, transient stability, dynamic stability, equal area criterion and stability reserve. Power system protection: Components of power system protection (circuit breakers, relays, instrument transformers). Principles of fault detection, discrimination and clearance; various types of relays used in power systems (protective schemes). Methods of protecting power system devices – (transmission lines, transformers, generators and motors). **Course Description:**	

Power System Analysis, Planning & Protection is a comprehensive course covering various aspects of electrical power systems. Topics include nonlinear and linear programming, load forecasting, generation, transmission, and distribution planning, voltage and frequency control, fault studies, principles of protection for high voltage (HV) and low voltage (LV) systems, over-voltage and insulation coordination, selection of circuit breakers, unit and distance protection, electromagnetic, solid-state, and digital equipment for protection and control of substations, and fuses and earth leakage devices.

Course Aims:

- Understanding of Power System Operations: Provide students with an understanding of the operation, planning, and protection of electrical power systems, including generation, transmission, and distribution.
- Load Forecasting and System Planning: Introduce students to load forecasting techniques and system planning methodologies for efficient and reliable power distribution.
- Fault Studies and Analysis: Familiarize students with the analysis of symmetrical and unsymmetrical faults in power systems and the principles of fault protection.
- Principles of Protection Equipment: Equip students with knowledge of protective switchgears such as circuit breakers, instrument transformers, and relays, and their mode of operation in power systems.
- Voltage and Frequency Control: Provide students with an understanding of voltage and frequency control mechanisms to maintain system stability and reliability.
- Insulation Coordination and Over-voltage Protection: Introduce students to insulation coordination principles and techniques for protecting power systems against over-voltages.
- Selection and Application of Circuit Breakers: Enable students to select appropriate circuit breakers based on system requirements and operating conditions.
- Unit and Distance Protection: Introduce students to unit and distance protection principles, including pile-to-wire, carrier current, and VHF communication, for effective fault detection and isolation.
- Use of Electromagnetic, Solid-State, and Digital Equipment: Familiarize students with the use of electromagnetic, solid-state, and digital equipment for protection and control of substations in power systems.
- Fuses and Earth Leakage Devices: Provide students with knowledge of fuses and earth leakage devices and their role in protecting electrical systems against faults and over-currents.

Learning Outcomes:

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

	➢ Analyze and forecast electrical load requirements for effective system planning and operation. ➢ Identify and analyze faults in power systems, including symmetrical and unsymmetrical faults, and implement appropriate protection measures. ➢ Understand the principles of operation of protective switchgears and their application in power system protection. ➢ Implement voltage and frequency control mechanisms to maintain system stability and reliability. ➢ Coordinate insulation and protect power systems against over-voltages. ➢ Select and apply circuit breakers based on system requirements and operating conditions. ➢ Implement unit and distance protection schemes for fault detection and isolation. ➢ Utilize electromagnetic, solid-state, and digital equipment for substation protection and control. ➢ Implement fuses and earth leakage devices for protection against faults and over-currents. By achieving these learning outcomes, students will develop the necessary skills and knowledge to analyze, plan, and protect electrical power systems effectively, ensuring the reliable and efficient supply of electricity in various industrial and commercial settings.	
EEE513	**Digital Communication**	**3 UNITS**
	Digital signals and characters. Serial and parallel data transmission systems. The ISO-OSI layered architecture, packet switching and circuit switching, error detection and recovery (ARQ) protocols, bridges and routers, basic queuing theory, telephone switches, Erlang-B and Erlang-C blocking formulae TCP/lP, X.25, signaling (Signaling System 7), personal Communication Service (PCS) networks, Broadband Networks. Modulated carrier signals: Binary modulation (ASK, PSK, FSK), spread spectrum. **Course Description:** Digital Communication is a comprehensive course focusing on the principles, techniques, and applications of digital communication systems. The course covers topics such as the block diagram of digital communication systems, sampling theorem, quantization, coding, modulation techniques, error detection and correction, information theory, and applications in various communication technologies including satellite, microwave, wireless, and optical communication.	

Course Aims:

- Fundamentals of Digital Communication Systems: Introduce students to the basic concepts and block diagrams of digital communication systems, including sampling theorem, aliasing, quantization, and coding.
- Performance Analysis in Noisy Environments: Analyze the performance of digital communication systems in the presence of noise, including techniques for filtering, equalization, and error detection/correction.
- Digital Modulation Techniques: Explore various digital modulation techniques such as Frequency Shift Keying (FSK), Amplitude Shift Keying (ASK), Quadrature Phase Shift Keying (QPSK), M-ary PSK, and Quadrature Amplitude Modulation (QAM).
- Information Theory and Channel Capacity: Discuss the concepts of information theory, including entropy, information rate, and channel capacity, and their implications in digital communication system design.
- Trade-offs between Bandwidth and Signal-to-Noise Ratio (SNR): Understand the trade-offs between bandwidth and SNR in digital communication systems and their impact on system performance and efficiency.
- Applications in Communication Technologies: Explore the application of digital communication systems in various communication technologies, including satellite communication, telephony, microwave communication, wireless communication, and optical communication.

Learning Outcomes:

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

- Understand the fundamental principles and block diagrams of digital communication systems.
- Analyze and evaluate the performance of digital communication systems in noisy environments.
- Design and implement digital modulation techniques for efficient data transmission.
- Apply error detection and correction techniques to enhance the reliability of digital communication systems.
- Calculate and analyze information theoretic measures such as entropy, information rate, and channel capacity.
- Evaluate trade-offs between bandwidth and SNR in digital communication system design.
- Understand and apply digital communication systems in various communication technologies, including satellite, microwave, wireless, and optical communication.
- By achieving these learning outcomes, students will be well-equipped to design, analyze, and optimize digital communication systems for a wide range of applications in modern communication networks and technologies.

Course Description:

EEE514 High Voltage Engineering and Protection is an advanced course designed to provide students with specialized knowledge and skills in the field of high voltage engineering. The course encompasses various aspects of high voltage systems, including generation, measurement, testing, and protection. Topics covered include high voltage generation methods, measurement techniques, electrical discharges, surge propagation phenomena, protection systems, insulation coordination, breakdown mechanisms, switchgear construction, and arc extinction techniques. Additionally, the course delves into the operation and characteristics of circuit breakers, protection devices, and distance relays used in high voltage systems.

Aim:

The aim of EEE514 is to equip students with a deep understanding of high voltage engineering principles and practices, as well as the necessary skills to design, analyze, and operate high voltage systems effectively. By exploring advanced concepts and technologies in high voltage engineering and protection, the course aims to prepare students for careers in power systems engineering, electrical utilities, research and development, and related fields.

Learning Outcomes:

Upon successful completion of EEE514, students will be able to:

- Demonstrate comprehensive knowledge of high voltage generation methods, measurement techniques, and testing procedures used in high voltage systems.
- Analyze and evaluate electrical discharge phenomena, surge propagation mechanisms, and insulation coordination principles in high voltage applications.
- Design and implement protection systems for high voltage equipment and systems, including the selection and application of protective devices such as circuit breakers and relays.
- Explain the operation and characteristics of various types of circuit breakers used in high voltage systems, including air, oil, gas, and vacuum circuit breakers.
- Evaluate the performance and reliability of arc extinction techniques used in high voltage switchgear, including arc quenching methods and arc interruption principles.
- Interpret and apply relevant standards and regulations governing high voltage engineering and protection practices.
- Demonstrate proficiency in conducting high voltage tests and measurements, including insulation testing, dielectric strength testing, and partial discharge detection.
- Analyze and troubleshoot high voltage systems and equipment to identify and rectify faults, ensuring the safety and reliability of the electrical infrastructure.
- Collaborate effectively with multidisciplinary teams to design, implement, and maintain high voltage systems in industrial, commercial, and utility settings.

	➢ Demonstrate awareness of emerging trends and advancements in high voltage engineering and protection, and their implications for future developments in the field.	
EEE514	**High Voltage Engineering and Protection**	**2 UNITS**
	Generation of high voltages and currents. High voltage measurement and testing. Breakdown phenomena. Insulation coordination. Circuit interruption and protection. Basic structure of protection scheme. Main criteria for detecting faults. Circuit breakers. Analogue protection. Digital protection: Digital protection and control system structure. Computer based protection and control. Logical structure of simple protection devices. Logical structure for determining the operating characteristics of a distance relay. Logical structure for transformer differential protection devices. **Course Description:** EEE514 High Voltage Engineering and Protection is an advanced course designed to provide students with specialized knowledge and skills in the field of high voltage engineering. The course encompasses various aspects of high voltage systems, including generation, measurement, testing, and protection. Topics covered include high voltage generation methods, measurement techniques, electrical discharges, surge propagation phenomena, protection systems, insulation coordination, breakdown mechanisms, switchgear construction, and arc extinction techniques. Additionally, the course delves into the operation and characteristics of circuit breakers, protection devices, and distance relays used in high voltage systems. **Aim:** The aim of EEE514 is to equip students with a deep understanding of high voltage engineering principles and practices, as well as the necessary skills to design, analyze, and operate high voltage systems effectively. By exploring advanced concepts and technologies in high voltage engineering and protection, the course aims to prepare students for careers in power systems engineering, electrical utilities, research and development, and related fields. **Learning Outcomes:** Upon successful completion of EEE514, students will be able to: ➢ Demonstrate comprehensive knowledge of high voltage generation methods, measurement techniques, and testing procedures used in high voltage systems.	

	➢ Analyze and evaluate electrical discharge phenomena, surge propagation mechanisms, and insulation coordination principles in high voltage applications. ➢ Design and implement protection systems for high voltage equipment and systems, including the selection and application of protective devices such as circuit breakers and relays. ➢ Explain the operation and characteristics of various types of circuit breakers used in high voltage systems, including air, oil, gas, and vacuum circuit breakers. ➢ Evaluate the performance and reliability of arc extinction techniques used in high voltage switchgear, including arc quenching methods and arc interruption principles. ➢ Interpret and apply relevant standards and regulations governing high voltage engineering and protection practices. ➢ Demonstrate proficiency in conducting high voltage tests and measurements, including insulation testing, dielectric strength testing, and partial discharge detection. ➢ Analyze and troubleshoot high voltage systems and equipment to identify and rectify faults, ensuring the safety and reliability of the electrical infrastructure. ➢ Collaborate effectively with multidisciplinary teams to design, implement, and maintain high voltage systems in industrial, commercial, and utility settings. ➢ Demonstrate awareness of emerging trends and advancements in high voltage engineering and protection, and their implications for future developments in the field.	
EEE515	**Mobile and Wireless Communication Systems**	**2 UNITS**
	Overview, Fundamentals of Cellular Systems: the cellular concept, basic building blocks of cellular systems, handoffs, power control, traffic engineering. Propagation Aspects: Antennas, large-scale effects, small-scale effects, propagation models. Speech Coding: Introduction to speech codes that are used in mobile communication systems. Modulation Techniques: Digital modulation techniques, spread spectrum modulation (direct sequence and frequency hopping), orthogonal frequency-division multiplexing (OFDM). Mitigation Techniques: Equalization, diversity, channel coding. Multiple Access Techniques: Frequency division multiple access, time division multiple access, code division multiple access, cellular concept and random-access techniques. Encoding/decoding: unblock and convolutional	

codes. Introduction to MIMO systems. Wireless Standards and Systems: 1G-5G cellular system, IS-95, UMTS, LTE,

Course Description:
EEE515 Mobile and Wireless Communication Systems is a comprehensive course that explores the principles, technologies, and systems used in mobile and wireless communication. The course covers fundamental concepts of cellular systems, including the cellular concept and basic building blocks of cells. Additionally, students will delve into propagation aspects, including antenna characteristics, large-scale effects, small-scale effects, and propagation models. The course also introduces speech coding techniques relevant to mobile communication systems, digital modulation techniques, spread spectrum modulation, mitigation techniques, equalization, MIMO systems, and wireless standards ranging from 1G to 5G cellular systems, including LTE.

Aim:
The aim of EEE515 is to provide students with a thorough understanding of mobile and wireless communication systems, technologies, and standards. By studying the principles and techniques underlying cellular systems, propagation, modulation, and standards evolution, students will develop the knowledge and skills necessary to design, analyze, and optimize mobile and wireless communication networks and systems. The course aims to prepare students for careers in telecommunications engineering, research, and development in the rapidly evolving field of mobile and wireless communication.

Learning Outcomes:
Upon successful completion of EEE515, students will be able to:

- Explain the principles and concepts of cellular systems, including the cellular concept and the basic building blocks of cells.
- Analyze propagation aspects in mobile and wireless communication systems, including antenna characteristics, large-scale effects, small-scale effects, and propagation models.
- Describe speech coding techniques used in mobile communication systems and their impact on voice quality and bandwidth efficiency.
- Evaluate digital modulation techniques and spread spectrum modulation methods used in wireless communication systems.
- Apply mitigation techniques to address interference and noise in wireless communication channels.
- Explain equalization techniques used to compensate for channel distortion in wireless communication systems.
- Describe the principles and advantages of Multiple Input Multiple Output (MIMO) systems in wireless communication.
- Discuss the evolution of wireless standards from 1G to 5G cellular systems, including LTE, and compare their key features and performance characteristics.

	➢ Analyze and interpret performance metrics and parameters in mobile and wireless communication systems, such as signal-to-noise ratio, bit error rate, and throughput. ➢ Design and optimize mobile and wireless communication networks and systems based on specific requirements, constraints, and objectives.	
EEE516	**Power System Operation and Control**	**2 UNITS**
	Unit Commitment: in unit commitment, spinning reserve, thermal unit, hydro, must run fuel. Unit commitment solution methods: priority-list methods and dynamic-programming solution. Power system security: Factor affecting power system security. Contingency Analysis: Zbus methods, network sensitivity methods and ac load flow methods. Control of generation: Generator model. Load model. Tie-line model. Generation control: supplementary control action, tie-line control and automatic generation control (AGC). Excitation control: Excitation power, voltage, quality; Type of excitation system- unit, common bus; Exciters-dc, ac, brushless, self-excitation; Excitation system response. **Course Description:** EEE516 Power System Operation and Control provides students with an in-depth understanding of the principles, methodologies, and techniques involved in the operation and control of power systems. The course covers advanced topics such as unit commitment, spinning reserve management, and fuel scheduling strategies for thermal and hydroelectric power units. Additionally, students will explore solution methods for unit commitment problems, including priority list methods and dynamic programming solutions. The course also addresses factors affecting power system security, including network sensitivity, Zbus methods, and AC load flow analysis. Furthermore, students will study the control of generation, including generation models, load models, tie-line models, and automatic generation control. Excitation power voltage quality and various types of excitation systems will also be discussed. **Aim:** The aim of EEE516 is to provide students with a comprehensive understanding of the operation and control principles in power systems. By studying advanced concepts and techniques in unit commitment, power system security, and generation control, students will develop the knowledge and skills necessary to optimize the operation of power systems, ensure stability, reliability, and efficiency, and effectively manage the generation and distribution of electrical power. **Learning Outcomes:**	

	Upon successful completion of EEE516, students will be able to: ➢ Analyze unit commitment problems and apply solution methods such as priority list methods and dynamic programming to optimize the scheduling of thermal and hydroelectric power units. ➢ Manage spinning reserves effectively to ensure the reliability and stability of power systems during unforeseen contingencies. ➢ Evaluate fuel scheduling strategies for different types of power generation units, considering factors such as fuel availability, cost, and environmental impact. ➢ Identify and assess factors affecting power system security, including network sensitivity, and use methodologies such as Zbus methods and AC load flow analysis to enhance system reliability and stability. ➢ Understand and implement control strategies for power generation, including automatic generation control, load shedding, and economic dispatch. ➢ Interpret and apply various generation models, load models, and tie-line models to analyze and optimize power system operation. ➢ Evaluate excitation power voltage quality and its impact on power system stability and performance. ➢ Identify different types of excitation systems and their applications in power generation and control. ➢ Analyze and interpret data from power system simulations and real-time monitoring systems to assess system performance and identify areas for improvement. ➢ Collaborate effectively with power system engineers, operators, and stakeholders to implement control strategies and optimize power system operation.	
EEE517	**Instrumentation Engineering**	**2 UNITS**
	Instrumentation system and their components. Transducer specifications; static and dynamic specifications. Sources of error in transduction process. Effects of the transducer on the measured. Effects of other physical properties on the measured. Position transducer: potentiometers, linear and rotary variable differential transformers, optical encoder, synchros and resolvers. Force transducers: stress and strain, strain gauge, Wheatstone bridge circuit and load cells. Motion transducers: velocity and acceleration transducers. Fluid transducers: pressure, flow and level transducers. Temperature transducers: thermocouple, RTD, thermistor, integrated-circuit temperature transducers. Signal conditioners and transmission: zero and span circuits: floating and instrumentation amplifier Voltage-to-current conversion: floating and grounded loads, dedicated IC voltage-to-	

current converters. Current-to-voltage conversion, voltage-to-frequency conversion and frequency-to-voltage conversion. Isolation circuits: general concepts, transformer-coupled amplifiers, optically coupled amplifiers, optical coupling for on/off applications. Cabling: magnetic and electrostatic shielding, grounding. Includes lectures, demonstrations, mini project and laboratory assignments.

Course Description:
EEE517 Instrumentation Engineering offers students a comprehensive understanding of instrumentation systems and their components, focusing on transducers and their specifications, error sources in the transduction process, and the effects of transducers on measured quantities. The course covers a range of transducers, including potentiometers, linear and rotary variable differential transformers, optical encoders, synchros, resolvers, force transducers, stress and strain sensors, such as strain gauges, and temperature transducers like thermocouples. Additionally, the course explores voltage to current conversion techniques. Through theoretical discussions, practical demonstrations, and hands-on laboratory exercises, students will gain the knowledge and skills necessary to design, analyze, and troubleshoot instrumentation systems in various engineering applications.

Aim:
The aim of EEE517 is to provide students with a thorough understanding of instrumentation engineering principles and practices, focusing on transducer technologies and their applications in measuring physical quantities. The course aims to equip students with the knowledge and skills necessary to select, calibrate, and integrate transducers into instrumentation systems effectively. By exploring the theoretical foundations and practical aspects of instrumentation engineering, students will be prepared to contribute to the design, development, and optimization of measurement and control systems in diverse engineering domains.

Learning Outcomes:
Upon successful completion of EEE517, students will be able to:
- Describe the principles of instrumentation systems and identify their key components and functions.
- Specify transducers based on performance requirements, including accuracy, sensitivity, linearity, and frequency response.
- Identify sources of error in the transduction process and apply strategies to minimize measurement uncertainties and improve system reliability.
- Analyze the effects of transducers on measured quantities and evaluate the performance characteristics of different types of transducers.

	➢ Explain the operating principles and applications of various transducers, including potentiometers, linear and rotary variable differential transformers, optical encoders, synchros, resolvers, strain gauges, thermocouples, and voltage to current converters. ➢ Design and implement voltage to current conversion circuits using appropriate electronic components and techniques. ➢ Perform calibration procedures for transducers and instrumentation systems to ensure accurate and reliable measurements. ➢ Analyze real-world engineering problems and select appropriate transducers and instrumentation techniques to address specific measurement requirements. ➢ Interpret measurement data and communicate findings effectively through technical reports and presentations. ➢ Demonstrate proficiency in using instrumentation tools, equipment, and software for data acquisition, processing, and analysis.	
EEE518	**Antenna Theory and Radial System**	**2 UNITS**
	Concept of antenna radiation patterns, radiation resistance, gain, effective area, reciprocity. Traveling wave and HF antenna. Analysis, design and evaluation of antenna, small and large HF types, special microwave antennas. Principle of range and direction finding by means of radio echoes. Requirements and limitation of radar, modulation and microwave components of radar. Includes lectures, demonstrations, mini project and laboratory assignments**.** **Course Description:** EEE518 Antenna Theory and Radial System provides students with a comprehensive understanding of antenna theory and its applications in communication and radar systems. The course covers concepts such as antenna radiation patterns, radiation resistance, gain, travelling wave antennas, and high-frequency (HF) antennas. Additionally, students will learn about the analysis, design, and evaluation of antennas for various applications. The course also explores principles of range and direction finding using radio echoes, as well as the requirements and limitations of radar modulation and microwave components. Through mini projects and laboratory assignments, students will gain hands-on experience in designing, testing, and evaluating antenna systems. **Aim:** The aim of EEE518 is to equip students with the theoretical knowledge and practical skills necessary to understand, design, and evaluate antenna systems for communication and radar applications. By studying antenna theory and radial systems, students will develop a deep understanding of the principles underlying antenna operation	

	and their significance in modern communication and radar technologies. The course aims to prepare students for careers in antenna design, telecommunications engineering, radar systems engineering, and related fields. **Learning Outcomes:** Upon successful completion of EEE518, students will be able to: ➢ Explain the concepts of antenna radiation patterns, radiation resistance, and gain, and analyze the performance of different types of antennas. ➢ Design and evaluate antenna systems for specific communication and radar applications, considering factors such as frequency, bandwidth, and directional properties. ➢ Demonstrate an understanding of travelling wave antennas and their advantages in certain applications, such as HF communication. ➢ Apply principles of range and direction finding using radio echoes, and analyze the performance of directional antennas for these purposes. ➢ Evaluate the requirements and limitations of radar modulation techniques and microwave components in radar systems. ➢ Demonstrate proficiency in the use of software tools for antenna analysis, simulation, and design. ➢ Apply theoretical knowledge to solve practical problems related to antenna design, performance optimization, and system integration. ➢ Communicate effectively about antenna theory, design principles, and system evaluation through written reports and oral presentations. ➢ Collaborate effectively with team members in mini projects and laboratory assignments, demonstrating teamwork and problem-solving skills. ➢ Demonstrate a commitment to professional ethics and standards in antenna design, testing, and evaluation.	
EEE519	**Object Orientation Programming Simulation**	**2 UNITS**
	The use of Object-Oriented Programming (OOP) to develop computer simulations of engineering problems. Programming with the C++ and MATLAB languages. (OOP) concepts including classes, inheritance and polymorphism. Programming with class libraries. Event-driven simulation techniques in an objects-oriented environment. Programming projects will include the development of a simulator for an engineering application. Includes lectures, demonstrations, mini-project and laboratory assignments. **Course Description:** EEE519 Object Oriented Programming Simulation introduces students to the principles and techniques of using object-oriented	

programming (OOP) for developing computer simulations of engineering problems. The course focuses on programming with C++ and MATLAB languages, emphasizing OOP concepts such as classes, inheritance, and polymorphism. Students will learn to utilize class libraries and implement event-driven simulation techniques in an object-oriented environment. The course includes lectures, demonstrations, mini-projects, laboratory assignments, and a programming project that involves the development of a simulator for engineering applications.

Aim:
The aim of EEE519 is to equip students with the knowledge and skills required to apply object-oriented programming techniques to simulate engineering problems effectively. Through hands-on programming experiences and project-based learning, the course aims to provide students with a solid foundation in OOP concepts and their application in engineering simulation. By the end of the course, students will be able to develop and analyze simulations for various engineering applications using C++ and MATLAB.

Learning Outcomes:
Upon successful completion of EEE519, students will be able to:

- Understand and apply the principles of object-oriented programming (OOP) in the development of computer simulations for engineering problems.
- Utilize programming languages such as C++ and MATLAB to implement OOP concepts including classes, inheritance, and polymorphism.
- Implement event-driven simulation techniques using OOP principles to model dynamic systems and processes in engineering.
- Effectively use class libraries and external resources to enhance the functionality and efficiency of simulation programs.
- Design and develop simulation software for engineering applications, considering factors such as accuracy, efficiency, and usability.
- Analyze and interpret simulation results to gain insights into the behavior of complex engineering systems and processes.
- Collaborate with peers to work on programming projects, sharing ideas and knowledge to achieve common goals.
- Demonstrate proficiency in debugging, testing, and optimizing simulation programs to ensure reliability and performance.
- Communicate effectively about simulation design, implementation, and results through written reports, presentations, and demonstrations.
- Apply critical thinking and problem-solving skills to address challenges encountered during the development and implementation of engineering simulations.

EEE520	**Radio and Television Broadcasting**	**2 UNITS**
	Radio spectrum, ITU and spectrum management, transmission lines and Scattering Parameters; Design of RF component (low noise amplifiers, power amplifiers, Oscillator, RF power detector, active and passive mixers); introduction to telephony, signaling system. Principles of automatic telephone; strowger and cross bar exchanges electronic switching system. Traffic considerations. Telex and facsimile transmission, data transmission. Introduction to television engineering, black and white television broadcasting, colour television systems. Cable TV system. **Course Description:** EEE520 Radio and Television Broadcasting provides students with a comprehensive understanding of the principles and technologies underlying radio and television broadcasting systems. The course covers topics such as radio spectrum management, International Telecommunication Union (ITU) regulations, transmission lines, and scattering parameters. Additionally, students will learn about the design and implementation of RF components including low noise amplifiers, power amplifiers, oscillators, RF power detectors, and both active and passive components. The course also introduces students to telephony, signaling systems, cable TV systems, and telex technology. **Aim:** The aim of EEE520 is to equip students with the knowledge and skills necessary to design, analyze, and optimize radio and television broadcasting systems. By exploring the theoretical principles and practical applications of broadcasting technologies, the course aims to prepare students for careers in broadcast engineering, telecommunications, and related fields. Through theoretical instruction, laboratory experiments, and hands-on projects, students will develop a deep understanding of radio and television broadcasting systems and their role in modern communication networks. **Learning Outcomes:** Upon successful completion of EEE520, students will be able to: ➢ Explain the principles of radio spectrum management and the role of the International Telecommunication Union (ITU) in regulating spectrum usage. ➢ Analyze transmission lines and scattering parameters, and apply them to the design and optimization of RF components.	

	➢ Design and implement RF components such as low noise amplifiers, power amplifiers, oscillators, RF power detectors, and both active and passive components. ➢ Describe the principles of telephony, signaling systems, and their application in broadcasting and telecommunications. ➢ Evaluate the components and operation of cable TV systems, including signal distribution, modulation techniques, and reception equipment. ➢ Explain the principles of telex technology and its role in communication systems. ➢ Analyze the performance of radio and television broadcasting systems, including signal quality, coverage, and interference mitigation strategies. ➢ Demonstrate proficiency in using laboratory equipment and software tools for the design, simulation, and testing of broadcasting systems. ➢ Apply theoretical knowledge to solve practical problems and optimize the performance of broadcasting systems. ➢ Communicate effectively with stakeholders, including colleagues, clients, and regulatory bodies, regarding broadcasting system design, implementation, and operation.	
EEE522	**Control Systems Engineering III**	**2 UNITS**
	Analysis of control systems in state space: state space representation of transformer function systems. Transformation of system models with MATLAB. Solving time-invariant state equations. Some useful results in vector-matrix analysis. Controllability and Observability of systems. Design of Control Systems in State Space: Pole placement, solving pole-placement problems with MATLAB. Design of regulator-type systems by pole-placement. State observers. Design of state observers with MATLAB. Design of servo systems. Lyapunov stability analysis, Lyapunov stability analysis of linear time-invariant systems. Model-reference control systems. Quadratic optimal control. Solving quadratic control problems with MATLAB. **Course Description:** EEE522 Control Systems Engineering III is an advanced course that focuses on the analysis and design of control systems using state space techniques. The course covers topics such as the analysis of control systems in state space, state space representation of transfer function systems, transformation of system models using MATLAB, solving time-invariant state equations, and useful results in vector matrix analysis. Additionally, students will learn about the design of control systems in state space through pole placement techniques, solving pole placement problems with MATLAB, design of regular type	

	systems, state observers, design of state observers using MATLAB, and quadratic optimal control using MATLAB. **Aim:** The aim of EEE522 is to provide students with a deep understanding of advanced control system analysis and design techniques based on state space methods. The course aims to equip students with the knowledge and skills necessary to analyze complex control systems, design optimal control strategies, and implement state-of-the-art control solutions in engineering applications. Through theoretical instruction and hands-on experience with MATLAB, students will develop proficiency in state space control system analysis, design, and implementation. **Learning Outcomes:** Upon successful completion of EEE522, students will be able to: ➢ Analyze control systems using state space representation, understanding the advantages and limitations compared to traditional transfer function approaches. ➢ Transform system models between transfer function and state space representations using MATLAB, demonstrating proficiency in system modeling techniques. ➢ Solve time-invariant state equations using analytical methods and numerical techniques, demonstrating an understanding of system dynamics and behavior. ➢ Apply vector matrix analysis techniques to derive useful results for analyzing and designing control systems in state space. ➢ Design control systems in state space using pole placement techniques, demonstrating the ability to place closed-loop poles to achieve desired system performance. ➢ Solve pole placement problems using MATLAB, implementing control system designs and assessing system stability and performance. ➢ Design regular type systems using pole placement techniques, considering system constraints and specifications. ➢ Design state observers to estimate system states for feedback control, demonstrating proficiency in observer design methodologies. ➢ Implement state observers using MATLAB, simulating observer performance and assessing observer stability and accuracy. ➢ Design quadratic optimal control strategies using MATLAB, optimizing system performance criteria such as stability, transient response, and control effort.	
EEE524	**Process Control**	**2 UNITS**
	Wide range of concepts and techniques for designing process control systems extending beyond the standard classical feedback/PID tuning methods that form part of a typical undergraduate course. Advanced	

analog single loop control, digital (computer) control, and multivariable control analysis and design procedures are presented. A detailed presentation of the internal model control design procedure for both continuous-time (analog) and discrete-time (digital) control systems, making single-loop designs work in multivariable systems through the judicious design of decentralized and decoupled control systems, and the design of control systems for constrained multivariable processes via Model Predictive Control. The application of these concepts to important problem areas that lie beyond process control (specifically, enterprise system/supply chain management and adaptive interventions in behavioral health) will be presented. A brief overview of system identification techniques in support of advanced control system design will also be discussed. Includes lectures, demonstrations, mini project and laboratory assignments.

Course Description:

EEE524 Process Control offers an in-depth exploration of advanced concepts and techniques essential for designing and implementing process control systems in engineering applications. The course extends beyond traditional undergraduate content, covering topics such as advanced analog single-loop control, digital control, multivariable control analysis, and design procedures. Students will also delve into internal model control design procedures for both continuous-time and discrete-time systems, decentralized and decoupled control system design, and model predictive control for constrained multivariable processes. Additionally, the course provides an overview of system identification techniques to support advanced control system design. Through a combination of lectures, demonstrations, mini-projects, and laboratory assignments, students will gain practical experience and theoretical knowledge necessary for tackling complex process control challenges.

Aim:

The aim of EEE524 is to provide students with a comprehensive understanding of advanced process control concepts and techniques beyond classical feedback PID tuning methods. The course aims to equip students with the knowledge and skills necessary to design and implement sophisticated control systems for engineering processes. By exploring advanced control theories and methodologies, students will develop the expertise required to address complex process control problems and optimize system performance in various engineering applications.

	Learning Outcomes: Upon successful completion of EEE524, students will be able to: ➢ Analyze and apply advanced analog single-loop control techniques in engineering processes. ➢ Design and implement digital control systems for improved performance and efficiency. ➢ Evaluate multivariable control systems and apply appropriate analysis and design procedures. ➢ Demonstrate proficiency in internal model control design for both continuous-time and discrete-time systems. ➢ Design decentralized and decoupled control systems to make single-loop designs work in multivariable systems effectively. ➢ Apply model predictive control techniques to design control systems for constrained multivariable processes. ➢ Utilize system identification techniques to support the design and optimization of advanced control systems. ➢ Demonstrate practical skills in implementing control algorithms through mini-projects and laboratory assignments. ➢ Analyze and troubleshoot complex process control systems to optimize performance and ensure stability. ➢ Communicate effectively and collaborate with team members to solve process control problems and achieve project goals.	
EEE597	**Project I**	**3 UNITS**
	The student prepares a project report in the final year of their study on a selected and approved project topic in any aspect of the discipline. The student is expected to plan and carry out an investigation on the project under the supervision of a member of staff. The student will be assessed by presentation and defense of his project report before an External Examiner. **Course Description:** EEE597 Project I is a capstone course designed for final-year students in the Electrical and Electronic Engineering program. In this course, students are tasked with preparing a comprehensive project report on a selected and approved topic within any aspect of the discipline. Under the guidance of a faculty member, students will plan, conduct research, and investigate the chosen project topic. The culmination of the course involves the presentation and defense of the project report before an external examiner. Through this project, students will demonstrate their ability to apply theoretical knowledge, research skills, and engineering principles to solve real-world problems in the field of electrical and electronic engineering. **Aim:**	

	The aim of EEE597 Project I is to provide final-year students with the opportunity to integrate and apply their knowledge, skills, and competencies acquired throughout their undergraduate studies to a substantial engineering project. By undertaking independent research and project work, students will develop critical thinking abilities, problem-solving skills, and project management capabilities essential for success in their future careers as electrical and electronic engineers. **Learning Outcomes:** Upon successful completion of EEE597 Project I, students will be able to: ➢ Select and define a project topic within the discipline of electrical and electronic engineering, considering its relevance, feasibility, and potential impact. ➢ Develop a comprehensive project plan, including objectives, scope, methodology, and timeline, in consultation with a faculty supervisor. ➢ Conduct thorough research and investigation on the selected project topic, utilizing appropriate research methods, tools, and resources. ➢ Apply engineering principles, theories, and techniques to analyze, design, and implement solutions to engineering problems encountered during the project. ➢ Demonstrate effective project management skills, including time management, resource allocation, and risk assessment, to ensure the successful completion of the project within the specified timeline and budget. ➢ Communicate project progress, findings, and outcomes effectively through written reports, presentations, and other forms of documentation. ➢ Present and defend the project report before an external examiner, articulating the rationale, methodology, results, and conclusions of the project with clarity and confidence. ➢ Collaborate effectively with faculty supervisors, peers, and other stakeholders throughout the project lifecycle, demonstrating teamwork, professionalism, and interpersonal skills. ➢ Critically evaluate the strengths, weaknesses, and implications of the project outcomes, reflecting on the lessons learned and areas for further improvement or future research. ➢ Demonstrate ethical conduct, integrity, and accountability in all aspects of the project work, adhering to professional standards and ethical guidelines governing engineering practice.	
EEE598	**Project II**	**3 UNITS**
	The student prepares a project report in the final year of their study on a selected and approved project topic in any aspect of the discipline.	

	The student is expected to plan and carry out an investigation on the project under the supervision of a member of staff. The student will be assessed by presentation and defense of his project report before an External Examiner. **Course Description:** EEE598 Project II is a culmination of the student's academic journey in Electrical and Electronic Engineering (EEE). In their final year of study, students undertake a comprehensive project where they are required to select and develop a project topic within any aspect of the discipline. Under the guidance and supervision of a faculty member, students plan and conduct an in-depth investigation, applying the knowledge and skills acquired throughout their academic program. The culmination of the project is the preparation of a detailed project report, which the student presents and defends before an external examiner. **Aim:** The aim of EEE598 Project II is to provide students with an opportunity to demonstrate their ability to independently plan, execute, and present a substantial engineering project within the field of Electrical and Electronic Engineering. By engaging in a real-world project, students will further develop their technical skills, problem-solving abilities, project management capabilities, and communication skills. The course aims to prepare students for the challenges and responsibilities of professional engineering practice by providing them with practical experience in applied research, innovation, and project execution. **Learning Outcomes:** Upon successful completion of EEE598 Project II, students will be able to: ➢ Formulate a well-defined project topic or research question within the field of Electrical and Electronic Engineering, demonstrating a clear understanding of the project scope, objectives, and significance. ➢ Develop a comprehensive project plan, including timelines, milestones, resource requirements, and risk management strategies, to ensure successful project execution. ➢ Conduct a systematic investigation or experimentation to collect relevant data, analyze findings, and draw conclusions based on sound engineering principles and methodologies. ➢ Apply theoretical knowledge, analytical techniques, and practical skills acquired throughout their academic program to solve complex engineering problems and address real-world challenges. ➢ Demonstrate proficiency in the use of engineering tools, software, and experimental equipment relevant to the chosen project topic,	

	ensuring accuracy, efficiency, and reliability in data collection and analysis. ➢ Prepare a high-quality project report that effectively communicates the project objectives, methodology, findings, and conclusions in a clear, concise, and well-organized manner. ➢ Deliver a professional oral presentation and defend the project report before an external examiner, showcasing their ability to articulate key concepts, justify design decisions, and respond to questions and feedback effectively. ➢ Reflect on their project experience, identifying strengths, weaknesses, lessons learned, and areas for improvement, and demonstrating a commitment to lifelong learning and professional development. ➢ Collaborate effectively with project supervisors, peers, and stakeholders, demonstrating teamwork, leadership, and interpersonal skills in project management and execution. ➢ Adhere to ethical standards and professional codes of conduct in all aspects of project planning, execution, and reporting, demonstrating integrity, responsibility, and accountability as future engineers.	

10. STAFF OF THE DEPARTMENT OF ELECTRICAL AND INFORMATION ENGINEERING

S/N	Name of Academic Staff	Area of Specialization	Discipline	Qualifications	Status	Rank
Academic						
1.	Engr. Dr. O. J. FAMORIJI	Communication Engineering (Signals and systems, electromagnetic sensing, array processing, antennas and propagation)	Electrical & Electronic Engineering	B.Tech. (2009), M.Eng. (2014), PhD. (2019) MNSE, COREN Reg.	Ag. HOD	Reader/Associate Professor
2.	Engr Prof. POPOOLA	Communication (Radio Spectrum Management with Cognitive Radio Technology)	Electrical & Electronic Engineering	B.Eng. (1999), M.Eng. (2003), PhD. (2012) MNSE, COREN Reg.	Visiting	Professor
3.	Engr. Dr. I.A. DANIYAN	Advanced Manufacturing and Automation	Mechanical Engineering	B.Eng.(2008), M.Sc.(2012), PhD (2017), COREN Reg.	Full-Time	Reader/Associate Professor
4.	Engr. Dr. ADU	Power & Machine	Electrical & Electronic Engineering	B.Eng. (1994), M. Eng. (2000), Ph.D.(2017), MNSE, COREN Reg.	Adjunct	Senior Lecturer
5.	Dr. C. S. ODEYEMI	Electronics Engineering	Electrical & Electronic Engineering	M.Sc.(2010), Ph.D. (2018)	Adjunct	Senior Lecturer

6.	Dr. E. O. OYEKANMI	Computer Science (High Performance Computing)	Computer Science	B.Tech. (2008), M.Sc. (2012), Ph.D. (2019)	Adjunct	Senior Lecturer
7.	Engr. Dr. P.T. OGUNBOYO	Power Systems, Renewable Systems and Machines	Electrical and Electronic Engineering	PGD (2010) B. Eng (2014) Ph.D (2018) COREN Reg.	Visiting	Senior Lecturer
8.	Engr. A. LAWAL	Mechanical Engineering (Production Option)	Machine Design	PGD (2006), M. Eng. (2014), Ph.D. (in View) COREN Reg.	Full-Time	Lecturer I
9.	Engr. H. G. OLOTUAH	Communication Engineering	Electrical & Electronics Engineering	B.Eng. (1988), M.Eng. (2005), PhD (in View), COREN Regd.	Full-Time	Lecturer I
10.	Engr. M.O. OMOJOYEGBE	Communication Engineering	Electrical & Electronics Engineering	PGD (2015) B.Eng. (2022), M.Eng. (2019), PhD (in View), COREN Regd.	Full-Time	Lecturer II
11.	Mr. Dedacus Nnadozie OHAEBUSHI	Power System Engineering	Electrical & Electronics Engineering	B.Sc. (2013), M.Eng. (2022), PhD (in View),	Full-Time	Lecturer II
12.	Mr. T. D. MAKANJU	Power System Engineering	Electrical & Electronics Engineering	B.Tech. (2018), M.Eng. (2021), PhD (in View),	Full-Time	Lecturer II (Study Leave)

13.	Engr. O. A KEJEMILOBI	Computer Engineering	Computer Engineering	ND (2007) HND (2011) B. Eng. (2022) M. Eng. (in View)	Full-Time	Assistant Lecturer
Laboratory Technologist						
1.	Engr. R. O. IJAWOYE	Communication Engineering	Electrical & Electronics Engineering	HND (1998), PGD (2010), M.Eng. (2013), MNSE, COREN Reg.	Full-time	Senior Technologist
2.	Mr. S. J. ADEPOJU	Automobile Engineering	Automobile Engineering	M.Ed. (2017), B.Ed. (2014)	Full-time	Senior Technologist
3.	Engrn. S. B. ADESINA	Automation Engineering	Electrical & Electronics Engineering	HND (2010), ND (2008),	Full-time	Technologist I
4.	Mr. E. F. KIBUEBU	Electronics and Telecommunication Engineering	Electrical & Electronics Engineering Technology	HND (2015), ND (2007),	Full-time	Technologist II
5.	Mr. S. O. ASOLO	Control and Instrumentation	Electrical & Information Engineering	HND (2012) ND (2009)	Full-time	Technologist II
6.	Mrs. J. O. AFOLABI	Laboratory Attendant	Laboratory Attendant	ND (2016), SSCE (2013)	Full-time	Laboratory Attendant

Administrative						
1.	Miss. U. H. ISRAEL	Confidential Secretary to the HOD	Confidential Secretary	HND (2014)	Full-time	Confidential Secretary