ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

DEPARTMENT OF INFORMATION COMMUNICATION ENGINEERING

Handbook for Undergraduate Programme
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Note: 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.

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Preface

The Departmental handbook provides information to prospective and registered students on programme of studies offered by the Department of Information Communication Engineering, Elizade University, Ilara - Mokin, 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 programme is designed to facilitate specialization while allowing opportunities for taking approved courses from other areas. The programme is also fashioned to allow the prospective engineer graduate to have appropriate technical expertise and human perspective.

The Department of Information Communication Engineering, Elizade University, Ilara - Mokin, Ondo State, Nigeria issues this handbook as a general guide to its courses and facilities. Itforms no part of a contract. The department reserves the right to modify or alter without prior notice any of the contents herein, subject to substantive regulation of the University.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 The University's Mission

To produce graduates with the appropriate skills and knowledge for the development of the nation and global competitiveness.

1.2 The University's Vision

Elizade University seeks to be a globally competitive institution that produces entrepreneurial, innovative and ethical graduates.

1.3 History and Location of the Programme in the University

The Elizade University is located in lIara-Mokin in Ondo State of Nigeria. The State was created on 3 February 1976 from the former Western State. It originally included what is now Ekiti State, which was carved out of Ondo State in 1996. Akure is the State capital. The State lies between Longitudes 4° 30' and 6' East of the Greenwich Meridian, 5° 45' and 8° 15' North of the Equator. This means that the State lies' entirely in the tropics. Ondo State is bounded in the North by Ekiti and Kogi States; in the East by Edo State; in the West by Oyo and Ogun States; and in theSouth by the Atlantic Ocean. The State has a land area of 14,788.723 Square Kilometers. The State has a population of 3,441,024 comprising 1,761,263 males and 1,679,761 females.

Elizade University emphasizes learning, research and development. Having completed all due processes, approval for the establishment of Elizade University was given by the Federal Government on 22 February, 2012. The approval was conveyed vide the Provisional License to Operate as a Private University No. 46 dated 28 February, 2012 issued by the National Universities Commission. Elizade University aims to attract the best and the brightest students in Nigeria and beyond. The main aim is to provide them with practical-oriented scientific, technological and arts education which shall make them self-reliant while preparing them for future leadership and success in their chosen careers in the highly competitive new knowledge society. Academic activities of the Elizade University started at 2012/2013 session (6^{th} January, 2013). The Engineering Faculty at the Elizade University commenced in September, 2013 during the 2013/2014 academic session.

The Department of Information Communication Engineering took-off in the 2013/2014 academic year with five students. As one of the pioneer departments in the Faculty of Engineering, The department commenced academic activities at the beginning of 2013/2014 academic session. Currently, 27 students are enrolled in its full-time Bachelor of Engineering (ICE) programme.

1.3 The University's Strategic Objectives

The strategic objectives of the University (Elizade University, Ilara-Mokin) are to:

a. produce graduates of international standard, with adequate knowledge and skills in their field of study, who will be highly employable and self-reliant;
b. provide high quality research and development activities that will promote the development of the Nation and enhance the image of the University and the researchers;
c. harness modern technology especially ICT and modern social, economic and financial strategies to run a cost-efficient and effective academic programme and institutional management;
d. provide services that are relevant and impactful to the local community and the Nation;
e. provide conditions of study, work and living in the University Community that are of appropriate standards;
f. expand access to tertiary education in the face of unmet demand; and
g. operate as an equal opportunity educational institution, sensitive to the principle of gender equity and non-discriminatory based on race, ethnicity, religion or physical disability.

CHAPTER TWO

2.0 GENERAL INFORMATION TO STUDENTS

2.2 Roll of Honours for Students

Senate decided that Roll of Honours for Students be instituted in the University to enhance discipline and good performance among students. All students are enjoined to strive to be on the Honours Roll. The Details of the honours roll are as follows:

The beneficiaries must the minimum required CGPA and the beneficiary must maintain this grade annually to continue to enjoy the award. The recommendations must be processed along with results of second Semester Examinations. Student must be of good conduct. He or she must not have outstanding or carry-over courses and must not be repeating the year. Nostudent on Leave of Absence shall enjoy the Annual Roll of Honours Award. No student that has adisciplinary problem shall enjoy the award. The award shall be based on the recommendation of the Department Board of Examiners and the Faculty Board of Examiners. Each beneficiary shall be given a certificate and scholarship.

The Honours Roll shall be at three levels as follows:

a. Founder list : for suitably qualified candidate with a minimum CGPA of 4.50 on a basis of5.00
b. VC list: for suitably qualified candidate with a minimum CGPA of 4.20 on a basis of 5.00,and
c. Dean’s list: for suitably qualified candidate with a minimum CGPA of 4.00 on a basis of5.00

2.3 Information on Division of Students' Affairs

Information on students’ welfare can be summarized as follows:

a. Guidance and Counselling Unit: The Division of Student Affairs has Professional Counsellors who are committed to helping students grow in self-understanding in the Process of integrating their personal and academic experiences. The Services are .free to students and are confidential (not used as part of his/her other University records). The services include personal Counselling, group counselling, study skills improvement, tests anxiety reduction, personal crisis intervention, psychological testing, career and occupational counselling and settlement of grievances between students, where necessary, consultations are made with campus organizations, sound academic Departments, to ensure that students' problems are resolved satisfactorily. The Counsellors can be contacted on the ground floor of the Senate Building;
b. Scholarship and Financial Assistance: The Division of Students' Affairs serves as a link between students and Sponsoring authorities, both within and outside Nigeria. Students areto check the Notice Boards in their respective faculties as well as those at the Division of Student Affairs

Building for advertisements and other relevant information. Liaison is also maintained between students and governments at various levels for scholarship and bursaries.

2.4 Information on the University Library

Membership of the Library is available, on completion of a registration card, to all students, members of the senior staff of the University and such other persons as may be determined by the Library Committee or the University Librarian on behalf of it. Students are required to renew their registration at the beginning of each academic year. Library cards and borrower's tickets are not transferable; books issued on them remain the responsibility of the person whose name appears on them. A lost library card or borrower's ticket may be replaced on submission of a written application.

2.5 Disciplinary Measures

a. Examination Offences

i. A candidate shall not be allowed during an examination to communicate by word or otherwise with any other candidate nor shall leave his place except with the consent of an invigilator. Should a candidate act in such a way as to disturb or inconvenience other candidates, he shall be warned and if he persists, he may, at the discretion of the invigilator, be excluded from the examination room. Such an action by the invigilator must also be reported in writing through the Head of Department to the Vice Chancellor within 24 hours.

ii. It shall be an examination offence for any student, staff or any person whatsoever to impersonate a candidate in any University examination. Any student or staff of the University found guilty under this regulation shall be subjected to disciplinary action by the appropriate authority of the University. The candidate impersonated shall also be liable to an infraction of this regulation where it is established directly from circumstantial evidence that the impersonation is with his knowledge or connivance.

iii. No candidate shall take into an examination room, or have in his possession during an examination any book or paper or printed or written documents, whether relevant to the examination or not, unless specifically authorized to do so. An invigilator has authority to confiscate such documents.

iv. Mobile phones are not allowed in examination halls.

v. A candidate shall not remove from an examination room any papers, used or unused, except the question paper and such book and papers, if any, as he is authorized to take into the examination room.

vi. Candidates shall comply with all “direction to candidates set out on an examination answer book or other examination materials supplied to them. They shall also comply with direction given to

them by an Invigilator.

vii. Candidates shall not write on any paper other than the examination answer booklets. All rough work must be done in the answer booklets and crossed out neatly. Supplementary answer booklets, even if they contain only rough work must be tied inside the main answer booklet.

viii. When leaving the examination room, even if temporarily, a student shall not leave his written work on the desk but he shall hand it over to an Invigilator. Candidates are responsible for proper return of their written works.

ix. Smoking shall not be permitted in examination room during examination sessions.

x. Any candidates or staff who attempts in any way to unlawfully have or give pre-knowledge of an examination question or to influence the marking of scripts or the award of marks by the University examiner shall be subjected to disciplinary action by the appropriate authority of the University.

xi. If any candidate is suspected of cheating, receiving assistance or assisting other candidates or infringing any other examination regulation, a written report of the circumstance shall be submitted by the invigilator to the Vice Chancellor within 24 hours of the examination session. The candidate concerned shall be allowed to continue with the examination.

xii. Any candidate suspected of examination malpractice shall be required to submit to the invigilator a written report immediately after the paper. Failure to make a report shall be regarded as a breach of discipline. Such report should be forwarded along with the invigilator's report to the Vice Chancellor.

xiii. Where a Head of Department fails to forward a report on examination malpractice to the Vice Chancellor, such action would be considered as misconduct.

xiv. Where the Vice Chancellor is satisfied on the basis of the report forwarded to him that any candidate has a case to answer, he shall refer the case to the Central Committee on Examination Malpractices.

b. Penalties for Examination Malpractices and other Offences

i. Any examination offence would attract appropriate penalty including outright dismissal from the University.

ii. Where the Vice Chancellor has reason to believe that the nature of any question or the content of any paper may have become known before the date and time of the examination to any persons other than examiners of the paper, the Board of Examiners and any official of the University authorized to handle the paper, he may order the suspension of the examination or the cancellation of the paper or setting of a new paper and shall report the matter to the Senate.

The Vice Chancellor shall also take any disciplinary measure against any student or students involved as he may deem appropriate.

iii. If in the opinion of an invigilator, circumstances arise which render the examination unfair to any candidate, he must report the matter to the Vice Chancellor within 24 hours after the examination. Where such matter is reported to the Vice Chancellor he may take such action as he deems fit. If he directs that another examination be held, that examination shall be the examination for the purpose of this regulation.

iv. Any candidate or member of staff may complain to the Vice-Chancellor that an examination has been improperly conducted. The Vice-Chancellor shall investigate the complaint and report the results of his investigations to the Senate which shall take such action as it may deem appropriate, including with-holding a result or deprivation of the award of a degree, diploma etc. as laid down in her Statues. However, where it is shown to the satisfaction of the Committee of Deans that any alteration or amendment of a University regulation involving a change in a course of study or in examination requirements has caused hardship to a candidate in any examination, the Committee of Deans shall make such provisions as it thinks fit for the relief of such hardship and report same to Senate.

CHAPTER THREE

3.0 THE INFORMATION AND COMMUNICATION ENGINEERING PROGRAMME

3.1 Programme Philosophy

In the Department of Information Communication Engineering, students are trained for the award of Bachelor of Engineering (B.Eng.) degree in Information Communication Engineering. The teaching and research are based on sound academic foundation as well as practical orientation that will be sufficient to make them employable in industries.

The philosophy of the programme is to produce graduates that combines sound theoretical background with practical skills to enable them take up challenging positions in the Information Communication Technology and manufacturing industries, public service and the academia directly and also to reach a level of practical sufficiency that would enable them to be self-employed.

3.2 Career Opportunities

Information and Communication Engineering (ICE) professionals conduct research, plan, design, write, test, provide advice and improve information technology systems, hardware, software and related concepts for specific applications. Opportunities abound for them as Technical Supports who typically handles both hardware and software issues at the user level, helping out the less tech-savvy with their computer problems making communication skills, problem solving, and well-rounded tech knowledge an asset. Computer programmers are the brains behind software functions – they write and test the code that makes up software programs. Web developers are the ones who are responsible for building websites and infrastructures behind them making a careful balance of creativity and technical prowess a must for those looking to join this area of information technology. Computer systems analysts are the multitaskers of information technology; they have to understand computer hardware, software, and networks – and how they all come to work together. IT Security experts who involve in implementing and running security software, scanning for abnormalities, upgrading systems, and keeping their companies informed of the risks involved in daily activities. Network Engineers have *a lot in their plate* with respect to the duties they perform – they are in charge of setting up, administering, and maintaining and upgrading local and wide area networks for an organization.

3.3 Programme Educational Objectives (PEOs)

The Programme Educational Objectives of the Information and Communication Engineering

programme are to:

PEO 1: To produce graduates who are highly proficient in principles and advanced practical knowledge of information and communication engineering to solve complex engineering problems.

PEO 2: To develop graduates who can apply analytical and creative thinking skills to produce innovative information and communication engineering solutions that address societal challenges in various industries.

PEO 3: To train engineers who are continuously in pursuit of professional development, research and collaborations to ensure they remain updated and relevant in the field of information and communication engineering.

PEO 4: To produce graduates who consider ethical standards, environmental welfare and sustainable practices while deploying information technology and communication solutions to meet societal needs.

PEO 5: To produce information and communication engineering graduates with the ability to function in multidisciplinary settings through the combination of effective technical, communication and leadership skills to drive organizational success.

PEO 6: Provide the engineering industry with graduates who are highly employable and adequately equipped with entrepreneurial skills to assume technical and managerial positions as well as meet the dynamic demands of the global information and communication industry.

3.4 Programme Outcomes (POs)

The twelve Programme Outcomes as published in Section 3.2.2 of the COREN Engineering Accreditation Manual are identified as follows:

PO 1 - Engineering Knowledge

Apply knowledge of mathematics, natural and engineering, sciences, mechanical engineering fundamentals, and engineering principles to solve complex engineering problems.

PO 2 - Problem Analysis

Identify, formulate, conduct research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural and engineering sciences and principles.

PO 3 - Design/Development of Solutions

Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO 4 – Investigation

Conduct investigation of complex engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

PO 5 - Modern Tool Usage

Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations.

PO 6 - The Engineer and Society

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems.

PO 7 - Environment and Sustainability

Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts.

PO 8 - Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO 9 - Individual and Teamwork

Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

PO 10 - Communication

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

PO 11 - Project Management

Demonstrate knowledge and understanding of engineering management principles and economic decision making and apply these to one’s own work, as a member and leader in a team, to manage projects in multidisciplinary environments.

PO 12 - Life Long Learning

Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

3.5 Admission Requirements

Admission into the programme is either through Unified Tertiary Matriculation Examination (UTME) into 100-level or Direct Entry into 200-level.

a. Unified Tertiary Matriculation Examination (UTME)

Admission into 100 Level is through the UTME of the Joint Admission Matriculation Board in English Language, Mathematics, Physics and Chemistry. To be eligible for admission, candidates must have a minimum of five credit pass in the General Certificate of Education (Ordinary Level) or West African Senior Secondary Certificate Examination (WASSCE) or NECO or IJMB or its equivalent at not more than two (2) sittings in the following subjects: Chemistry, Physics, Mathematics and English Language. In addition, candidate may also be required to pass a post-UTME examination conducted by the university, subject to subsisting government regulations.

b. Direct Entry

In addition to the requirements specified above in (A), candidates seeking admission to 200 level must possess either of the following:

i. National Diploma (ND) at Upper Credit Level or equivalent in Information. Communication Technology or Computer Engineering or related discipline from recognised institutions.

ii. Good passes at the General Certificate of Education (Advanced Level) or itsequivalent in Chemistry, Physics and Mathematics.

CHAPTER SIX

6.0 PROGRAMME DURATION

The minimum duration of the programme is five academic sessions for students admitted to 100 - level through the UTME and four academic sessions for those admitted into 200 - level by Direct Entry, under the course unit system. Students may take longer than the minimum of academic sessions to complete the requirement for graduation but NOT more than 15 semesters for UTME entrants and 12 semesters in the case of Direct Entry students. Longer duration is subject to the approval of the university.

6.1 Transfer within the University

If a student transfers from one Faculty to another, the transfer would be treated as if he/she is just being admitted into the University. As part of the requirement for graduation, the student has to take all the foundation/compulsory courses in the new Faculty or Department. In that case, his/her stay in the new Faculty or Department should be 1.5 times the number of semesters required to complete a programme.

- Where a student transfers from a science-based Faculty to another, the computation of his result in the new Faculty shall take cognizance of his previous CGPA in the new Department. The duration of the stay in the University will be what remains of the 1.5 times the number of semesters required to complete the programme as approved by Senate.
- Where a student is transferring from an Engineering, science-based to Humanities, arts-based Faculty or vice-versa, the transfer shall be treated as if the student is just being admitted into the University. The GPA of the student will not be transferred to the new Department. He or She will, however, be required to take all the foundation or compulsory courses in the new Department.

6.2 Graduation Requirements

To be eligible for a degree of B.Eng. in Information and Communication Engineering of Elizade University Ilara-Mokin, a candidate must:

- pass all prescribed core courses as well as university and faculty required courses and electives;
- complete a minimum of 193 units if admitted through UTME and a minimum of 164 units, if by Direct Entry and obtain a CGPA of not less than 1.5; and
- complete successfully all field projects, laboratory practical and industrial attachments. Direct Entry students are expected to register and pass the General Studies Courses required by the university, i.e., GST 101, 102, 104, 105 and 106. In the event that they fail these courses, they must offer them formally as credit courses.

6.3 The Course Unit System and Computation of Cumulative Grade Point Average [CGPA]

The course units in the Department are organized on the course credit system per semester. A semester lasts for approximately 17 weeks, including the periods of registration and examinations, provided that not less than 14 weeks are devoted to actual teaching (Appendix A). One credit unit is the equivalent of 15 contact hours of classroom teaching or 30 hours of laboratory work. Most of the course units in the Department carry the weight of 2 or 3 credit units, suggesting that they are taught for 30 or 45 hours in the semester or 2 or 3 one-hour periods per week. In courses with practical component, this means that there are 15 hours of teaching and 45 hours of practicals to qualify for 2 credit units or 30 hours of teaching and 45 hours of practical for 3 credit unit courses.

However, there are fewer 3 credit unit courses which suggest that more work is required to be done in 45 contact hours per semester or the equivalent in terms of practical and classroom teaching. At the end of each semester, a final examination is given to bring the course to final conclusion. The final examination in each course unit is weighted 60% of the component. Usually, 2 continuous assignment (CA) per course unit carries the weight of 40% of total marks for the course. No student can pass in a course unit if he/she fails to submit the CA assignments.

6.4 Pattern of Examination

Each course shall be examined at the end of the course. The examination shall be conducted as prescribed by the Senate. Each examination shall be 1-3 hours in duration. In addition, there may be a practical paper and/or an oral examination. There shall be continuous assessment of each course and this shall constitute a percentage of the formal grade.

6.5 Eligibility for Participation in Examination

All students who are registered for a course in a given semester are eligible to sit for examination in that course EXCEPT for students in the following categories.

a. A student who fails to attend 75% of lectures or practical in the course.
b. A student who is absent from the university for one semester without any official notification and permission. Such a student is deemed by the Senate to have withdrawn from the university.

The implementation of the cases listed above is subject to Senate's approval on the recommendation of the faculty board.

6.6 Measurement of Performance

Performance in a course shall be measured in terms of the following.

a. The results of prescribed theory and practical examination;

b. Continuous assessment which shall constitute 40% of measured performance; and

c. Assessment of such essay, practical exercises and reports prescribed for each course.

6.7 Level of Performance Rating

A student shall be recorded as having attained a level of performance in a course as follows:

Level of Performance	Rating	Credit per Unit
A	70% - 100%	5 (Excellent)
B	60% - 69%	4 (Very Good)
C	50% - 59%	3 (Good)
D	45% - 49%	2 (Satisfactory)
E	44% - 40%	1 (Adequate)
F	0% - 39%	0 (Failure)

Based on the above, a student who obtained a grade of "A" in a 4-unit course has scored 20 credit points, and one who obtained a grade of C in that course has scored 12 credit points.

6.8 Release of Examination Results

a. At the end of each semester, a provisional list of successful candidates in courseexamination shall be published by the Chief Examiner soon after the ratification of the recommendation of the Board of Examiners by the Faculty Board.

b. The proceedings of Boards of Examiners are confidential and are in no circumstances tobe disclosed at any time to any candidate or to any other unauthorized person.

c. However, without prejudice to Regulation (b) above, a student contesting a given grade after the release of results can appeal to the Vice-Chancellor, who shall cause the Head of Department to call for the affected paper of the candidate for re-marking. This shall be done after payment of the prescribed fee.

d. The final results of candidates for the award of a degree shall be published by the Registrar after they have been approved by Senate.

6.9 Calculation of Grade Point Average [GPA]

The overall performance of each candidate during an entire semester shall be determined by means

of a weighted grade point average, obtained by awarding credit points in respect of each course multiplied by the numeral value of the grade obtained as follows:

Level of Performance	Rating	Credit Points per Unit
A	70% - 100%	5
B	60% - 69%	4
C	50% - 59%	3
D	45% - 49%	2
E	40% - 44%	1
F	0% - 39%	0

6.10 Definition of Terms

a. Student Workload: This is defined in terms of course units. One unit represents one hour of lecture or one hour of tutorial or 2 - 4 hours of practical work per week throughout a semester. Thus, a course in which there are 2 hours of lectures and 1 hour of tutorial per week is a 3 unit course.

b. Total Number of Units (TNU): 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 carrying 6 courses of 3 units each has a TNU of 18 for that semester. No student shall be allowed to carry (i.e., register for) or be examined in more than 24 units in any particular semester.

c. Cumulative Number of Units (CNU): This is the summation of total number of 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 CNU than his non-repeating colleagues. He will most likely require a longer time to complete requirements for the award of degrees.

d. Level of Performance Rating: This is the rating of grades obtained in terms of credit points per load unit. Based on the above, a student who obtained a grade of "A" in a 4-unit course has scored 20 credit points, and one who obtained a grade of C in that course has scored 12 credit points.

e. Total Credit Point (TCP): This is the sum of the products of the course units and rating in each course for the entire semester period. For example, consider a student who took 4 courses of 4 units each. Let's say the grade obtained in the four courses were C.B.E.D. respectively. The TCP of this student is obtained as $4 \times 3 + 4 \times 4 + 4 \times 1 + 4 \times 2 = 40$

f. Cumulative Credit Point (CCP): This is the summation of Total Credit Points over all

semesters from beginning to date.

g. **Grade Point Average (GPA):** This is the total credit points (TCP) divided by the total units (TNU). For example, consider the student's scores referred to above. His TCP is 40, and of course, his TNU is 20 (4 courses at 5 units each, for the semester). The highest 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 and this would happen if the student has F all round during the semester.

h. **Cumulative Grade Point Average (CGPA):** This is the summation of TCPs for all semesters, divided by the summation of TNUs for the said semesters. Like the GPA, CGPA obtained ranges from 0 to 5.

6.11 GPA and CGPA Sample Computations

Consider a student who has enrolled for his/ her 100-level courses and has just completed 2 full semesters in the University, His GPA and CGPA could be computed as follows (Tables 1a & 1b):

Table 1a: Example of CGPA Computation for First Semester

Course Code	Course Title	Units	Examination Score	Rating	CP	TCP	TNU
ELP 101	Entrepreneurial Leadership I	2	75 (A)	5	10	10	2
MTH 101	General Mathematics I	3	35 (F)	0	0	10	5
PHY 101	General Physics I	3	60 (B)	4	12	22	8
PHY 103	Practical Physics I	1	87 (A)	5	5	27	9
CHM 101	General Chemistry I	3	67 (B)	4	12	39	12
CHM 103	Practical Chemistry I	1	78 (A)	5	5	44	13
GST 101	Communication in English I	3	45 (D)	2	6	50	16
GNE 101	Introduction to Computer Technology	3	88 (A)	5	15	65	19
GST 109	Use of Library, Study Skills & ICT Literacy	1	70 (A)	5	5	70	20
GST 111	Citizenship and Human Kinetics Education	2	50 (C)	3	6	76	22

$$\text{GPA} = \frac{TCP}{TNU} = 3.45$$

Table 1b: Example of CGPA Computation for Second Semester

100-LEVEL: 2ND SEMESTER							
Course Code	Course Title	Units	Examination Score	Rating	CP	TCP	TNU
GNE 102	Engineer-in-Society	1	75 (A)	5	5	5	1
GNE 104	Introduction to Computational Software	1	75 (A)	5	5	10	2
GNE 106	Introduction to Engineering Drawing	1	60 (B)	4	4	14	3
MTH 102	General Mathematics II	3	87(A)	5	15	29	6
MTH 104	Vectoral Analysis	3	88(A)	5	15	44	9
CHM 102	General Chemistry II	3	67(B)	4	12	56	12
CHM 104	Practical Chemistry II	1	54(C)	3	3	59	13
PHY 102	General Physics II	3	78(A)	5	15	74	16
PHY 104	Practical Physics II	1	45(D)	2	2	76	17
PHY 106	Properties of Matter	1	56(C)	3	3	79	18
GST 102	Communication in English II	2	72(A)	5	10	89	20
GST 104	Philosophy, Logic and Issues in Science of Human Existence	1	76(A)	5	5	94	21
ELP 102	Entrepreneurial Leadership II	2	63(B)	4	8	102	23

Previous: TCP = 76, TNU = 22, GPA = 3.45; Current: TCP = 102, TNU = 23, GPA = 4.43

CGPA = $\frac{76+102}{22+23}$ = 3.95

6.12 Withdrawal from the University

Students are considered withdrawn from the University when their case falls under any of the following.

a. Termination of Studentship: A student that fails to register for courses in two consecutive semesters are credited with 2 Number of Registration Information (NRI)and subsequently withdrawn from the University.

b. Poor Academic Performance: A student is considered to have automatically withdrawn from the university if he/she scores a Cumulative Grade Point Average [CGPA] that is less than one in two consecutive semesters.

c. Voluntary Withdrawal: A student is also considered withdrawn when his/her application for voluntary withdrawal has been processed through all the statutorilymeetings for such a case.

d. Gross Misconduct: A student can also be considered for withdrawal through expulsion from the University when found guilty of a gross misconduct by the University Administration. Offences leading to such misconduct includes: examination malpractice disobedience to the University Authority through one of several misdemeanors.

6.13 Final Assessment and Classification

Final assessment of the student can be summarized as follows:

a. A student's workload is defined in terms of course units. One unit represents one hour of lecture or one hour of tutorial or 24 hours of practical work per week throughout a semester. All courses shall run for one semester or a full session of two semesters.

b. The final award and the class of the degree shall be based on the Cumulative Grade Point Average [CGPA] obtained by each candidate in all prescribed courses approved by the University. The final cumulative grade point average shall be calculated-on the basis of the total number of credit points and the total number of course units registered for during the course of the student's programme. In the case of a failed course, the candidate must repeat the course at the next available opportunity. If the course is an elective, the candidate may substitute another course which is an elective, and shall not be required to pass the failed elective course. If the course is a restricted elective, substitution can only be made from the list of restricted electives. The failed grade would, however, be reflected in the transcript.

c. A candidate who scores a cumulative grade point average [CGPA] of less than 1.00 in two consecutive semesters shall be required to withdraw from the University.

d. A candidate who has satisfactorily completed all requirements for the degree with an overall grade point average of not less than 1.50 shall be awarded the honours degree as follows:

I. First Class 4.50 - 5.00

II.	Second Class (Upper Division)	3.50 - 4.49
III.	Second Class (Lower Division)	2.40 - 3.49
IV.	Third Class	1.50 - 2.39
V.	Pass	1.00 - 1.49

Passes in required units of special electives is a requirement for graduation.

6.14 Student Registration on E-Portal

Visit the university URL with https://www.elizadeuniversity.edu.ng/ then click on Student portal URL or visit the student portal directly via https://student.elizadeuniversity.edu.ng/ . Follow the instruction. Pay the school fee and register all the necessary courses from course list for the programme through student.elizadeuniversity.edu.ng portal.

6.15 Members of Staff for the Programme

a. List of Existing Academic Staff for the Programme

S/N	Names	Discipline	Areas of Specialization	Qualifications	Rank	Employment Status	Mode of Employment
1	Engr. Prof. Kayode F. AKINGBADE	Electrical/ Electronics Engineering	Communication Engineering	M.Eng., Ph.D. (FUTA), (R.59101)	Professor	Full Time	Sabbatical
2	Engr. Prof. Philip G. OGUNTUNDE	Civil Engineering	Hydrology & Water Resources Engineering	B.Eng. M.Eng. (FUTA)., Ph.D. (Germany) (R.10235)	Professor	Full Time	Associate
3	Engr. Dr. Oluranti ABIOLA	Automotive Engineering	Ergonomics, Mechanical Production and Materials Engineering	B.Sc. MSc. PhD. (OAU) MNSE, COREN (R.35630)	Senior Lecturer	Full Time	Associate
4	Engr. Dr. Olusola OLORUNTOBA	Automotive Engineering	Steady State and Transient Liquid Gas Flow	B.Sc. (Lagos) Meng (Minna). PhD. (UK), (R.48892)	Senior Lecturer	Full Time	Associate
5	Engr. Dr. Samson I. OJO	Electronic and Electrical Engineering	Wireless Communication	B.Sc. MSc. PhD. (LAUTECH) MNSE, COREN (R42451)	Senior Lecturer	Full Time	Sabbatical
6	Engr. Dr. Olaitan O. AFOLABI	Computer Engineering	Secure Computing, Artificial Intelligence, Machine Learning, Intelligence of Things	B. Tech. (LAUTECH); M.Sc. (OAU) COREN (R.17989), MNSE, MBCS, MIEEE, MNCS, OWSD	Lecturer I	Full Time	Full Time
7	Engr. Yusuf I. SHOBOWALE	Computer Engineering	Wireless Communication and Security, Blockchain	B.Tech. (LAUTECH); M.Sc. (OAU), COREN	Lecturer II	Full Time	Full Time

S/N	Names	Discipline	Areas of Specialization	Qualifications	Rank	Employment Status	Mode of Employment
			Technology, Internet of Things	(R.68176), MNSE, (56184), MNIICTE			
8	Engr. Anthony O. UWADIA	Electrical and Electronics Engineering (Communication Option)	Machine Learning and Artificial Intelligence	B.Tech, M.Tech. (FUTA) COREN (R.71405)	Lecturer II	Full Time	Full Time
9	Engr. Osekhonmen V. ABHULIMEN	Computer Engineering	Artificial Intelligence, Machine Learning, Computer Vision	B.Eng, (UNIBEN) M. Eng. (FUTA) COREN (R.66129)	Lecturer II	Full Time	Full Time

b. List of Existing Technical Staff for the Programme

S/N	Name	Discipline	Areas of specialization	Qualifications	Rank	Employment Status	Mode of Appointment
1	Engr. Bisiriyu Temitope AYENI	Electrical Electronic Engineering	Electronics and Communication Engineering	ND (EKITI), HND (ONDO), PGD (FUTA) (R27838)	Principal Technologist	Full Time	Full Time
2	Engr. Gbenga A. OLADUNNI	Electrical Electronic Engineering	Electronics and Telecommunication	ND (Ekiti), HND, PGD, M.Sc, (FUTA), (R.32977)	Senior Technologist	Full Time	Full Time
3	Engr. Ajiboye M. KAYODE	Computer Engineering	Information and Communication Engineering	ND (Ekiti), HND (Ede), NATE (C-12085), (R9156ET)	Senior Technologist	Full Time	Full Time
4	Mr. Bunmi J. ABIODUN	Electrical /Electronic Engineering	Telecommunication Engineering	ND (Bida)	Laboratory Assistant	Full Time	Full Time

c. List of Existing Administrative Staff for the Programme

S/N	Name	Discipline	Qualification	Rank	Employment Status	Mode of Appointment
1	Mrs. Bolanle OGIDAN	Secretarial Studies	ND (Ado-Ekiti), HND (Owo)	Confidential Secretary	Full Time	Full Time
2	Mrs. Jolayemi AWOLOWO	English/Yoruba	NCE, (Ikere-Ekiti, 2006).	Higher Executive Officer	Full Time	Full Time

CHAPTER SEVEN

7.0 LIST OF COURSES FOR THE PROGRAMME

Programme Workload for 100 – level 1st Semester

Course Code	Course Title	U*	ST	Contact hours per week		
				L	T	P
CHM 101	General Chemistry I	3	C	2	1	0
CHM 103	Practical Chemistry I	1	C	0	0	3
MTH 101	General Mathematics I (Algebra and Trigonometry)	3	C	2	1	0
PHY 101	General Physics I	3	C	2	1	0
PHY 103	Practical Physics I	1	C	0	0	3
GST 101	Communication in English I	2	C	1	1	0
GST 109	Use of Library, Study Skills & ICT	1	C	1	0	0
GST 111	Citizenship and Leadership Education	1	E	1	0	0
GNE 101	Introduction to Computer Technology	3	C	2	0	3
Total		**18**				

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s), P – Practical Hour(s)*
Core (C), Elective (E)

Programme Workload for 100 – level 2nd Semester

Course Code	Course Title	U	ST	Contact hours per week		
				L	T	P
CHM 102	General Chemistry II	3	C	2	1	0
CHM 104	Practical Chemistry II	1	C	0	0	3
MTH 102	General Mathematics II (Calculus)	3	C	2	1	0
MTH 104	General Mathematics IV (Vector Mechanics)	3	C	2	1	0
PHY 102	General Physics II	3	C	2	1	0
PHY 104	Practical Physics II	1	C	0	0	3
PHY 106	Properties of Matter	1	C	1	0	0
GNE 102	Engineer –in– Society	1	C	1	0	0
GNE 104	Intro. to Computational Software	1	C	1	0	0
GNE 106	Introduction to Engineering Drawing	1	C	0	0	3
GST 102	Communication in English II	2	C	1	1	0
Total		**20**				

Programme Workload for 200 – level 1st Semester

Course Code	Course Title	U	ST	Contact hours per week			PREQ.
				L	T	P	
CSC 201	Computer Programming I	3	C	2	0	3	
GNE 251	Engineering Drawing I	3	C	1	0	6	

Course Code	Course Title	U	ST	Contact hours per week			PREQ.
				L	T	P	
GNE 253	Engineering Mathematics I	3	C	2	1	0	MTH 101
GNE 255	Applied Mechanics	3	C	2	1	0	
GNE 257	Fundamentals of Electrical Engineering I	2	C	2	0	0	
GNE 259	Materials Science	3	C	2	0	3	
GNE 297	Fundamentals of Electrical Engineering Laboratory I	1	C	0	0	3	
GST 215	Entrepreneurship I	2	C	2	0	0	
GST 205	Nigerian Peoples and Cultures	1	E	1	0	0	
Total		**21**					

Programme Workload for 200 – level 2nd Semester

Course Code	Course Title	U	ST	Contact hours per week			PREQ.
				L	T	P	
GNE 252	Workshop Practice	2	C	1	0	3	
GNE 254	Engineering Mathematics II	3	C	2	1	0	MTH 102
GNE 256	Fundamentals of Fluid Mechanics	2	C	2	0	0	PHY 106
GNE 258	Fundamentals of Electrical Engineering II	2	C	2	0	0	
GNE 260	Strength of Materials I	3	C	2	0	3	
GNE 262	Fundamentals of Thermodynamics	2	C	2	0	0	
GNE 296	Fundamentals of Fluid Mechanics Lab. I	1	C	0	0	3	
GNE 298	Fundamentals of Electrical Engineering Laboratory II	1	C	0	0	3	
GST 210	Introduction to Musicology	1	C	1	0	0	
GST 216	Entrepreneurship II	2	C	0	0	6	
CSC 206	Human Computer Interaction	2	R	2	2	0	
Total		**21**					

Programme Workload for 300 – level 1st Semester

Course Code	Course Title	U	ST	L	T	P	PREQ.
GNE 351	Engineering Mathematics III	3	C	2	1	0	GNE 253
EEE 353	Instrumentation and Measurements	3	C	2	0	3	
EEE 351	Electromagnetic Field	3	C	2	1	0	MTH 103
EEE 357	Electric Circuits	3	C	2	1	0	GNE 207
EEE 355	Physical Electronics	3	C	2	0	3	
ICE 301	Operating Systems	3	C	2	1	0	
ICE 303	Database Design and Management	2	C	2	0	0	
Total		**20**					

Programme Workload for 300 – level 2nd Semester

Course Code	Course Title	U	ST	L	T	P	PREQ.
GNE 352	Engineering Mathematics IV	3	C	2	1	0	GNE 254
GNE 354	Engineering Communications	2	R	2	0	0	
EEE 354	Electromagnetic Waves	2	C	2	0	0	EEE 351
EEE 352	Electrical Machines I	3	C	2	0	3	GNE 258
ICE 302	Information System Analysis and Design	2	C	1	0	3	
ICE 304	Computer Organization and Architecture	3	C	2	1	0	
CSC 310	Object-Oriented Programming	3	C	2	0	3	
Total		**18**					

Programme Workload for 400 – level 1st Semester

Course Code	Course Title	U	ST	L	T	P	PREQ
GNE 451	Engineering Statistics	3	C	2	1	-	
EEE 453	Control systems I	2	C	2	-	-	EEE 357
ICE 401	Computer Security Techniques	2	C	2	-	-	
ICE 403	Data Communication System & Network Applications	3	C	2	-	3	
ICE 405	Internet Technology & Programming	3	C	2	-	3	
ICE 407	Data Structures and Algorithms	2	C	2	-	-	
ICE 409	Satellite Communication	3	C	2	1	-	
ICE 411	Communication Principles	3	C	2	1	-	
Total		**21**					

Programme Workload for 400 - level 2nd Semester

Course Code	Course Title	U	ST	L	T	P	PREQ
ICE 402	Student Work Experience Programme (SIWEP)	3	C	-	-	9	
ICE 404	Student Industrial Work Experience (SIWES I)	3	C	-	-	9	ICE 200
ICE 406	Student Industrial Work Experience (SIWES II)	9	C	-	-	27	ICE 300
Total		**15**					

Programme Workload for 500 - level 1st Semester

Course Code	Course Title	U	ST	L	T	P	PREQ.
GNE 551	Engineering Law and Management	3	C	2	1	-	
EEE 551	Digital Signal Processing	3	C	2	1	-	
ICE 501	Mobile Communication & Network	3	C	2	-	3	
ICE 503	Java Technology & Programming	2	C	2	1	-	
ICE 505	Artificial Neural Network	3	C	2	1	-	
ICE 509	Research Methodology	1	C	1	-	-	
	Electives (1 Course)	2	E	2	-	-	
ICE 511	Final Year Project 1	3	C	-	-	9	
Total		**20**					

Electives: Students are required to take a minimum of two units from any of the optional courses

Course Code	Course Title	U	ST	L	T	P	PREQ.
EEE 559	Telecommunication Engineering	2	E	2	-	-	EEE 457
ICE 513	Random Process & Queue Theory	2	E	2	-	-	
ICE 515	Project Management	2	E	2	-	-	

Programme Workload for 500 - level 2nd Semester

Course Code	Course Title	U	ST	L	T	P	PREQ.
GNE 552	Engineering Economics and Valuation	3	C	2	1	0	
ICE 502	Software Development Techniques	3	C	2	0	3	
ICE 504	Introduction to Enterprise Resource Planning Systems	3	C	2	1	0	
ICE 506	Design & Installation of ICT services	3	C	2	0	3	
	Electives (1 Course)	2	E	2	0	0	
ICE 512	Final Year Project II	3	C	0	0	9	ICE 511
EEE 552	Reliability and Maintainability of Electrical Systems.	2	C	2	0	0	
Total		**19**					

Electives: Students are required to take a minimum of four units from any of the optional courses

Course Code	Course Title	U	ST	L	T	P	PREQ.
ICE 508	Multimedia Technology & Programming	2	E	2	0	0	
ICE 510	Computer Graphics & Animation	2	E	1	0	3	
ICE 514	Cyberpreneurship & Cyber law	2	E	2	0	0	

OLD CURRICULUM TO BE COMPLETED BY 500L 2022/2023 SESSION

Programme Workload for 500 - level 1st Semester

Course Code	Course Title	U	ST	L	T	P
GNE 501	Engineering Economics	3	C	2	1	-
EEE 511	Reliability & Maintainability of Electrical Systems	2	C	2	-	-
EEE 519	Digital Signal Processing	3	C	2	1	-
ECT 513	Java Technology & Programming	2	C	2	1	-
ECT 515	Mobile Communication & Network	3	C	2	-	3
ECT 521	Cyberpreneurship & Media law	2	C	2	-	-
ECT 523	Computer Security Techniques	2	C	2	-	-
	Electives (2 Courses)	4	E	-	-	-
Total		**21**				

Electives: Students are required to take not more than four units from any of these optional courses.

Course Code	Course Title	U	ST	L	T	P
EEE 531	Introduction to Nanotechnology	2	E	2	-	-
EEE 539	Telecommunication Engineering	2	E	2	-	-
ECT 533	Random Process & Queue Theory	2	E	2	-	-
ECT 535	Data Structure & Algorithms	2	E	2	-	-

Programme Workload for 500 - level 2nd Semester

Course Code	Course Title	U	ST	L	T	P
GNE 502	Engineering Management	3	C	2	1	-
ECT 524	Computer Graphics & Animation	2	C	1	-	3
ECT 528	Design & Installation of Electrical & ICT Services	3	C	2	-	3
EEE 532	Object Oriented Design & Programming	3	C	2	-	3
ECT 590	Final Year Project	6	C	-	-	-
ECT 516	Software Development Techniques	3	C	2	-	3
	Electives (1 Course)	2	C	-	-	-
Total		**22**				

Electives: Students are required to take only two units from any of these optional courses

Course Code	Course Title	U	ST	L	T	P
ECE 526	Robotic & Automation	2	E	2	-	-
ECT 532	Multimedia Technology & Programming	2	E	2	-	-
ECT 534	Telecommunication Systems Planning	2	E	2	-	-

Old/New Course code	Course Title	Units
ECT 413/ICE 505	Artificial Neural Network	3 units
ECT 417/ICE 405	Internet Technology and Programming	3 units
ECT 535/ICE 407	Data Structures & Algorithm	2 units
ECT 524/ICE 510	Computer Graphics & Animation	3 units

7.1 Course Description

MTH 101 General Mathematics I 3 Units

Course Learning Outcomes (CLOs):

CLO1 Define and explain set, subset, union, intersection, complements, and demonstrate the use of Venn diagrams.

CLO2 Solve quadratic equations.

CLO3 Solve trigonometric functions.

CLO4 Identify various types of numbers.

CLO5 Solve some problems using binomial theorem.

Course Outline: Elementary set theory, subsets, union, intersections, complement, Venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binominal theorem. Complex numbers; algebra of complex numbers; the Argand Diagram. De Moivre's theorem, n^{th} roots of unity. Circular measure trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH 102 General Mathematics II 3 Units

Course Learning Outcomes (CLOs):

CLO1 Identify the types of rules in differentiation and integration.

CLO2 Recognise and understand the meaning of function of a real variable, graphs, limits and continuity.

CLO3 Solve some applications of definite integrals in areas and volumes.

CLO4 Solve function of a real variable, plot relevant graphs, identify limits and idea of

continuity.

CLO5 Identify the derivative as limit of rate of change

CLO6 Identify techniques of differentiation and perform extreme curve sketching

CLO7 Identify integration as an inverse of differentiation.

CLO8 Identify methods of integration and definite integrals.

CLO9 Perform integration application to areas, volumes.

Course Outline: Calculus: Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching, Integration as an inverse of differentiation. Methods of integration, Definite integral. Application to areas. Volumes etc.

MTH 104 General Mathematics IV **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Solve some vectors in addition and multiplication

CLO2 Calculate force and momentum.

CLO3 Solve differentiation and integration of vectors.

Course Outline: Vectors in Euclidean spaces, vector products, equation of lines and planes, element of vector calculus. General kinematics: momentum, angular momentum, fundamental equations of motion.

CHM 101 General Chemistry I **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Define atom, molecules and chemical reactions.

CLO2 Discuss the modern electronic theory of atoms.

CLO3 Write electronic configurations of elements on the periodic table

CLO4 Rationalise the trends of atomic radii, ionisation energies, electronegativity of the elements based on their position in the periodic table.

CLO5 Identify and balance oxidation– reduction equation and solve redox titration problems.

CLO6 Draw shapes of simple molecules and hybridised orbitals.

CLO7 Identify the characteristics of acids, bases and salts, and solve problems based on

their quantitative relationship.

CLO8 Apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures.

CLO9 Analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy.

CLO10 Determine rates of reactions and its dependence on concentration, time and temperature.

Course Outline: Atoms, atomic structures, atomic theory, atomic spectra, Aufbau method, Hund's rule, Pauli Exclusion principles, Periodicity and periodic table, molecules, chemical equation and stoichiometry Rates of chemical reaction, energetics Thermochemistry and simple calculations involving Hess's law, Bonding and intermolecular forces, Hybridization and shapes of molecules (Valence Forces; structure of Solids; molecular and ionic forces). Metals and extraction of metals, The Chemistry of selected metals and non- metals Chemical equilibrium reactions, Properties of gases, solutions, Redox reactions, Introduction to Electro-chemistry, electrolytic and galvanic cells, Fuel cells, electrode potential, half-cell equation. Faraday laws of electrolysis, Corrosion. Colligative properties, corrosion, Acid, Bases and salts, Introduction to Radioactivity.

CHM 102 General Chemistry II **3 Units**

Course Learning Outcomes (CLOs):

CLO1 State the importance and development of organic chemistry

CLO2 Define fullerenes and its applications

CLO3 Discuss electronic theory

CLO4 Determine the qualitative and quantitative of structures in organic chemistry

CLO5 State rules guiding nomenclature and functional group classes of organic chemistry

CLO6 Determine the rate of reaction to predict mechanisms of reaction

CLO7 Identify classes of organic functional group with brief description of their chemistry

CLO8 Discuss comparative chemistry of group 1A, IIA and IVA elements

CLO9 Describe basic properties of transition metals

Course Outline: Historical survey of the development and importance of organic chemistry, nomenclature and classes of organic compounds, Homologous series; isolation and purification of organic compounds; qualitative and quantitative- determination of empirical and molecular formulae, percentage purity, yield, organic chemistry; stereochemistry; determination of structure of organic compounds; Electronic theory in organic chemistry; Saturated hydrocarbons and Unsaturated hydrocarbons; alkenes, alkynes and aromatics. Functional group; carbonyls, halides, carboxylic acids and hydroxyl, Valence Forces; structure of Solids; molecular and ionic forces. The Chemistry of selected metals and non- metals– relative abundance.

CHM 103 Practical Chemistry I **1 Unit**

Course Learning Outcomes (CLOs):

CLO1 State the general laboratory rules and safety procedures.

CLO2 Collect scientific data and correctly carry out chemical experiments.

CLO3 Identify the basic glassware and equipment in the laboratory.

CLO4 State the differences between primary and secondary standards.

CLO5 Perform redox titration.

CLO6 Record observations and measurements in the laboratory notebooks.

Course Outline: Calibration of Measuring Instrument; Standardization of HCl with Standard Sodium carbonate; Standardization of alkali with standard potassium hydrogen phthalate. Determination concentrations of commercial (H_2SO+, HNO_3, NaOH); Preparation of Sulphide of Copper and determination of its Empirical Formula.; Determination of the atomic weight of a metal by forming its Oxides; Determination of atomic weight of a metal from the volume of Hydrogen it displaced from an acid; preparation of double salts; determination of heat of neutralization; determination of Faraday's constant. Introduction of scientific techniques to local science in the environment.

CHM 104 Practical Chemistry II **1 Unit**

Course Learning Outcomes (CLOs):

CLO1 State the general laboratory rules and safety procedures

CLO2 Collect scientific data and correct carry out chemical experiments

CLO3 Identify the basic glassware and equipment in the laboratory

CLO4 Identify and carry out preliminary tests which include ignition, boiling

point, melting point, test on known and unknown organic compounds.

CLO5	Carry out solubility tests on known and unknown organic compounds.
CLO6	Carry out elemental tests on known and unknown compounds.
CLO7	Carry out functional group/confirmatory test on known and unknown compounds which could be acidic/basic/ neutral organic compounds

Course Outline: Identification of elements in an organic compound Lassaigne: sodium fusion Test; Ignition Tests; Separation of mixtures, determination of Melting points; Re-crystallisation; Simple experiment reactions of Urea (carbamide); Test for aldehydes; Detection of carbonyl] group. Ignition test, Estimation of iron in ferrous ammonium sulphate using standardized potassium permanganate, Qualitative inorganic analysis.

PHY 101 General Physics I **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Identify and deduce the physical quantities and their units.
CLO2	Differentiate between vectors and scalars.
CLO3	Describe and evaluate motion of systems on the basis of the fundamental laws of mechanics.
CLO4	Apply Newton's laws to describe and solve simple problems of motion.
CLO5	Evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects.
CLO6	Explain and apply the principles of conservation of energy, linear and angular momentum.
CLO7	Describe the laws governing motion under gravity.
CLO8	Explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Outline: Space and Time, frames of reference, Invariance of physical laws, relativity of simultaneity, relativity of time intervals, relativity of length, units and dimension; standards and units, unit consistency and conversions. Kinematics vectors and vector addition, components of vectors, unit vectors, products of vectors. Displacement, Time and average velocity, instantaneous velocity, average acceleration, motion with constant acceleration, freely falling bodies, position and velocity vectors, acceleration vector, projectile motion. Motion in a circle and relative velocity. Fundamental laws of mechanics: forces and interactions, Newton's first law, Newton's second law,

mass and weight, Newton's third law. Statics and dynamics: application of Newton's laws, dynamics of particles, frictional forces, dynamics of circular motion. Galilean invariance, universal gravitation, gravitational potential energy, elastic potential energy, conservative and non-conservative forces. Work and energy, kinetic energy and the work-energy theorem, power, momentum and impulse, conservation of momentum, collisions and momentum conservation, elastic collisions, centre of mass. Rotational dynamics and angular momentum angular velocity and acceleration, energy in rotational motion, parallel axis theorem, torque, torque and rotation about a moving axis, simple harmonic motion and its applications. The simple pendulum, damped oscillations, forced oscillations and resonance.

PHY 102 General Physics II **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Explain the concepts of heat and temperature, and relate the temperature scales
CLO2	Define, derive and apply the fundamental thermodynamic relations to thermal systems.
CLO3	Describe and explain the first and second laws of thermodynamics, and the concept of entropy.
CLO4	State the assumptions of the kinetic theory and apply techniques of describing macroscopic behavior.
CLO5	Deduce the formalism of thermodynamics and apply it to simple systems in thermal equilibrium.
CLO6	Describe and determine the effect of forces and deformation of materials and surfaces.

Course Outline: Electrostatics: Conservation law of electric charges, electrons and electrostatics, Coulomb's law, electric field and forces, electric field line, electric dipoles charged particles in an electric field, charge and electric flux, Gauss's law and its applications, electric potential, electric potential due to a single charge, electric potential due to a dipole, electric potential due to continuous charge distribution equipotential surfaces. Conductors and currents: electric current, resistors and resistance, electric power, capacitors in series and parallel, energy storage in capacitors and electric field energy, Gauss's law in dielectrics. Magnetism: magnetic field, magnetic field lines and magnetic flux, motion of a charged particles in a magnetic field, magnetic force on a current carrying conductor, Ampere's law, Biot-Savart law, electromagnetic induction, inductance, self-inductance, mutual

inductance, Maxwell's equation, electromagnetic waves and oscillations.

PHY 106 Properties of Matter **1 Unit**

Course Learning Outcomes (CLOs):

CLO1	Identify matter in the solid, liquid and gaseous state
CLO2	Identify and describe the properties of matter
CLO3	Describe quantitatively the molecular structure of solids, liquids and gases, relating their properties to the forces and distances between molecules and to motion of molecules.
CLO4	Describe the relationship between motion of molecules and temperature.

Course Outline: Molecular treatment of properties of matter, elasticity; Hooke's law. Young's shear and bulk moduli. Hydrostatics; Pressure; buoyancy. Archimedes principles. Hydrodynamics; Streamlines Bernoulli and continuity equations. Turbulence, Reynolds number. Viscosity; Laminar flow, Poiseuilles's equation. Surface tension; adhesion, cohesion, capillarity, drops and bubbles. Temperature; zeroth law of thermodynamics; heat; gas laws of thermodynamics; kinetic theory of gases and application.

PHY 103 Practical Physics I **1 Unit**

Course Learning Outcomes (CLOs):

CLO1	Conduct measurements of some physical quantities.
CLO2	Make observations of events, collect and tabulate data.
CLO3	Identify and evaluate some common experimental errors
CLO4	Plot and analyse graphs.
CLO5	Draw conclusions from numerical and graphical analysis of data.

Course Outline: This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques will be employed. The experiments include: Mechanics: timing experiments, simple pendulum, compound pendulum, measurement of g, moments, determination of moment of inertia, measurement of viscosity, use of force board, law of momentum. Optics: reflection using plane mirror, convex/concave mirror, concave/convex lens, refraction using a prism, critical angle, apparent depth/real depth, simple microscope, compound microscope.

PHY 104 Practical Physics II **1 Unit**

Course Learning Outcomes (CLOs):

CLO1	Conduct measurements of some physical quantities
CLO2	Make observations of events, collect and tabulate data
CLO3	Identify and evaluate some common experimental errors
CLO4	Plot and analyse graphs
CLO5	Draw conclusions from numerical and graphical analysis of data
CLO6	Prepare and present practical reports

Course Outline: Electricity: Ohm's law, heating effect of a current internal resistance of a cell, Metre/Wheatstone bridge, potentiometer measurement of ece, plotting of magnetic field. Heat: measurement of specific capacity of water, and a solid, expansion of gas experiment using a long capillary tube, Joule's law. Sound: resonance tube, Sonometer.

GST 101 Communication in English I (study skills) **2 Units**

Course Learning Outcomes (CLOs):

CLO1	Identify possible sound patterns in English Language.
CLO2	List notable language skills.
CLO3	Classify word formation processes.
CLO4	Construct simple and fairly complex sentences in English.
CLO5	Apply logical and critical reasoning skills for meaningful presentations.
CLO6	Demonstrate an appreciable level of the art of public speaking and listening.
CLO7	Write simple and technical reports.

Course Outline: Introduction: the nature and functions of language, varieties and styles of English usage. Time Management. Study Skills; contemporary definition of literacy, introduction to the language skills. Vocabulary development: word formation, meaning relationships, register. Listening and Lecture Comprehension. Note -taking/note-making. Introduction to reading for Academic Purposes. Revision and test-taking skills

GST 102 Communication in English II **2 Units**

Course Learning Outcomes (CLOs):

CLO1	Identify possible sources and types of writing errors.
CLO2	Demonstrate ability to effectively construct technical report.

CLO3 Demonstrate ability to present oral written reports to wide variety of audience.

Course Outline: Awareness raising: sources and types of writing errors. Grammatical structures: element of the sentence. Word, Phrase and Clause. Sentence types: classification by structure and function. The paragraph: definition and characteristics, patterns of development. Varieties of writing: discourse types, writing formats. The Mechanics of writing. The academic writing process.

GST 109 Use of the Library and Information Literacy 2 Units

Course Learning Outcomes (CLOs):

CLO1 Describe the different library set up.

CLO2 Identify the different forms of recorded information.

CLO3 Use the virtual library.

CLO4 Use the library catalogue.

CLO5 Search for books and other materials relevant for intended research.

CLO6 Describe the organisation of a library.

Course Outline: Definition and types of library. Example of a library set up (introduction to the EUIM library). Organisation of a library. Forms of recorded information: print, non-print and electronic forms. Reference sources and services. Serials and periodicals. Use of ICT in the library. Internet applications: e-resources, social media networks, databases. Virtual libraries. Organization and retrieval of knowledge. The library catalogue. Classification schemes. Introduction to report writing. Search strategies, referencing. Referencing styles.

GNE 101 Introduction to Computer Technology 3 Units

Course Learning Outcomes (CLOs):

CLO1 Narrate the history of computer

CLO2 List components of a computer and their functions

CLO3 Identify the characteristics of a computer system

CLO4 Identify and differentiate the use computer hardware and computer software

CLO5 Run application package programs

CLO6 Develop flowcharts and algorithms for a problem

CLO7 Solve interactive problems using Python programming language in processing environment

Course Outline: History of Computers; functional components of a computer; characteristics of a computer system. Definition of computer science. History of computer science and their generations,

Computer Hardware; Modern I/O units. Software: Operating Systems, Application Packages Program: Development; Flowcharts and Algorithms; Program Object; VISUAL BASIC programming language serves as the vehicle to illustrate the many concepts.

GNE 102 Engineer-in-Society **1 Unit**

Course Learning Outcomes (CLOs):

CLO1 Differentiate between science, engineering and technology, and relate them to innovation

CLO2 Distinguish between the different cadres of engineering – engineers, technologists, technicians and craftsmen and their respective roles and competencies

CLO3 Identify and distinguish between the relevant professional bodies in engineering

CLO4 Identify and evaluate safety and risk analysis in engineering practice

Course Philosophy of Science and Engineering. History of Engineering and Technology. The Engineering profession - engineering - 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 to Risk analysis. Case studies from invited professionals.

GNE 104 Introduction to Computational Software **1 Unit**

Course Learning Outcomes (CLOs):

CLO1 Solve basics computational task with Matlab, MS Excel, Numpy and Pandas

CLO2 Explore basics of matlab, MS Excel, Numpy and Pandas.

CLO3 Identify computational software

Course Outline: This course covers the introduction and applications of commonly used computational software packages. Overview of Computational Software. Evolution and trends in Computational Software development. Using MATLAB as an example of computational Software. Introduction to MATLAB. Basic features of MATLAB. Creating MATLAB variables; managing MATLAB workspace; MATLAB mathematical functions. Basic plotting; Matrix generation; Array operations and Linear equations. Introduction to programming in MATLAB. Control flow and operators. Debugging M-files. Introduction to other computational software packages: overview of GNU Octave and Scilab.

GNE 106 Introduction to Engineering Drawing **1 Unit**

Course Learning Outcomes (CLOs):

CLO1	Recognition and mastery of the use of different drawing instruments
CLO2	Ability to prepare paper for drawing i.e., drawing of border lines and title blocks
CLO3	Ability to draw different kinds of geometrical shapes that will be encountered in the drawing of engineering components
CLO4	Formation of perfect corners/bends/edges on engineering components

Course Outline: Introduction to drawing instruments, scales, draughting aids and their proper use. Size of paper and drawing layout. Dimensioning, line work, layout and lettering. Geometrical constructions and Engineering graphics. Graphical calculus and Applications. Circles and Tangents. Conic sections, various methods of their construction. Cycloid, epi and hypocycloids. Involute. Archimedes spiral. Loci: the helix (cylindrical and conical) single and multi-start threads. Introduction to projections.

GST 111 Citizenship and Leadership Education **1 Unit**

Course Learning Outcomes (CLOs):

CLO1	Identify the qualities of a good citizen.
CLO2	Identify human right, the limitation, duties and obligations.
CLO3	Explain family life education.
CLO4	Identify the effect of drug abuse on human health.
CLO5	Explain the concept of health and disease.
CLO6	Identify the different types of leaders and political power.

Course Outline: Citizenship, qualities of a good citizen. Human rights, limitations to citizen's rights, protection of citizens' rights, duties and obligations: duties of citizens, obligations of citizens to the state. Moral principles and moral obligations, Drugs and medicines, drug abuse and its effects, drugs and health care, prescription and compliance, natural medicines and ethno therapy. Family life education: reproductive health, harmful health, practice safe motherhood, relationships and sexual behavior. Concepts of health and disease: concepts of well-being and disease, disease causation, HIV/AIDS, transition, prevention and control, stigmatization of responsibility, types of leadership, leadership and political power; Goal setting, vision and mission, Delegation of duties.

GST 205 Nigerian People and Cultures **1 Unit**

Course Learning Outcomes (CLOs):

CLO1 Analyse the historical foundation of Nigerian cultures and arts in pre-colonial times.

CLO2 Identify and list the major linguistic groups in Nigeria.

CLO3 Explain the gradual evolution of Nigeria as a political entity.

CLO4 Analyse the concepts of trade and economic self-reliance of Nigerian peoples in relation to national development.

CLO5 Enumerate the challenges of the Nigerian state regarding nation building.

CLO6 Analyse the role of the judiciary in upholding fundamental human rights.

CLO7 Identify the acceptable norms and values of the major ethnic groups in Nigeria

CLO8 List possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Outline: Introduction to Nigerian history, Introduction to Nigerian culture. Sources of Nigerian history. Culture and socialization. Primitive science and technology. Traditional religion and belief systems, Penetration of Christianity and Islam. Traditional political structures and administration. Modern day politics and culture. Culture and economic development. Traditional financial institutions. Festival and ritual in Nigerian culture. Festival as drama. Understanding the People/Cultures of Nigeria through their Art. The role of museums. Nigeria literature. The quest for appropriate technology. Cultural revival.

GST 210 Introduction to Musicology **1 Unit**

Course Learning Outcomes (CLOs):

CLO1 A deep understanding of the history and development of music, including different musical styles, genres, and traditions, and their social, political, and cultural contexts.

CLO2 The ability to analyze and interpret musical works and performances from different periods and cultures, using a range of critical and analytical methods.

CLO3 An appreciation of the diversity of musical expression and an understanding of how different musical traditions and practices are shaped by cultural, technological, and ideological factors.

CLO4 The ability to evaluate and critique musical works and performances, and to contribute to ongoing debates and discussions within the field of musicology.

CLO5 The development of strong research skills, including the ability to conduct original research, collect and analyze data, and present findings in a clear and compelling way.

Course Outline: Elements of music; rhythm combination and extension. Choral singing, ensemble work and special instrument (including voice).

GST 215 Entrepreneurship I **2 Units**

Course Learning Outcomes (CLOs):

CLO1 Explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation and risk-taking.

CLO2 State the characteristics of an entrepreneur.

CLO3 Analyse the importance of micro and small businesses in wealth creation, employment generation and financial independence.

CLO4 Engage in entrepreneurial thinking.

CLO5 Identify key elements in innovation.

CLO6 Describe the stages in enterprise formation, partnership and networking, including business planning.

CLO7 Describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world.

Course Outline: Introduction to entrepreneurship and new venture creation. Theory of entrepreneurship. Types of business organization. Initiating enterprises. Sources of finance/raising capital cost. Budgeting techniques and financial planning. Managerial functions with special emphasis on staffing. Marketing and the new venture. Accounting and special tax problems. Insurance issues in business. Environmental impact considerations. Student's business proposal.

GST 216 Entrepreneurship II **2 Units**

Course Learning Outcomes (CLOs):

CLO1 Demonstrate ability to effectively handle event pictures.

CLO2 Demonstrate ability to use photoshop.

CLO3 Demonstrate ability to effectively plan and manage events.

CLO4 Demonstrate ability to make shoes.

CLO5 Develop skills for fashion designing.

Course Outline: Photography, 2D & 3D animation & motion graphics, Beed making, event planning and management, Fashion designing, Tighing and Dyeing/Adire Fabrics, Shoe & Bag making, Make-up and gele.

CSC 201 Computer Programming I **3 Units**

Prerequisite: CSC 101

Course Learning Outcomes (CLOs):

CLO1 Describe and apply computing, software engineering knowledge, best practices, and standards appropriate for complex engineering software systems

CLO2 Develop competence in designing, evaluating, and adapting software processes and software development tools to meet the needs of an advanced development project through practical object-oriented programming exposure taught in concrete terms with a specific modern language – preferable selected from Python, Java or C++.

CLO3 Use widely available libraries to prepare them for machine learning, graphics and design simulations.

CLO4 Develop skills in eliciting user needs and designing an effective software solution.

CLO5 Recognise human, security, social, and entrepreneurial issues and responsibilities relevant to engineering software and the digitalisation of services.

CLO6 Acquire capabilities that can further be developed to make them productively employable by means of short Internet courses in specific areas.

Course Outline: An introduction to computer programing with emphasis on mathematical problems using python programing language or any other scientific programming language. Introduce students to computers, compilers and editors, and they are expected to write medium-sized programs. Implementation of concepts such as binding, scope, looping, branching, subprograms and parameter parsing, tasks and concurrency, heap management, exception handling, templates, inheritance and

overloading.

GNE 251 Engineering Drawing I **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Ability to present objects using different kind of projections such as isometric, oblique and orthographic projections
CLO2	Ability to do free-hand sketching
CLO3	Ability to draw the isometric projection of an object from its orthographic projection and vice versa
CLO4	Knowledge of different kinds of fasteners used in fabrication of objects and their representations
CLO5	Brief knowledge of draughting and simulation packages

Course Outline: Development of geometrical figures and intersection of solids and curves. Projections – lines, planes and simple solids. Orthographic projections in first and third angles. Isometric Projection; sections and sectioning, auxiliary views and staggered sectioning. Pictorial/Freehand Sketching. Conventional practices with Simple examples, including threads and threaded fasteners, cam profiles and Assembly drawing from detailed components. Introduction to Computer Aided Drafting: Electronic draughting packages: principle and use in engineering design. Simulation packages: principle and use in engineering.

GNE 252 Workshop Practice **2 Units**

Course Learning Outcomes (CLOs):

CLO1	Identify various basic hands and machine tools, analogue and digital measurement devices and instruments, and acquire skills in their effective use and maintenance
CLO2	Practically apply basic engineering technologies, including metrology, metal forming and joining, materials removal, and machine tooling
CLO3	Master workshop and industrial safety practices, accident prevention and ergonomics
CLO4	Physically recognise different electrical & electronic components like resistances, inductances, capacitances, diodes, transistors and their ratings
CLO5	Connect electric circuits, understand different wiring schemes, and check ratings

of common household electrical appliances and their basic maintenance

CLO6 Determine household and industrial energy consumption, and understand practical energy conservation measures

Course Outline: Safety procedure in workshop and Workshop setting; Types of workshop equipment, machines and materials; Use of instruments and tools (hand and machine tools), Measurement and marking out; Bench work and fitting; Machine operation practice. Carpentry: Hand tools and working principles; Joints and fastenings: bolt, rivet, welding, brazing, soldering. Invited lectures from Professionals.

GNE 253 Engineering Mathematics I **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Solve qualitative problems based on vector and matrix analyses such as linear independence and dependence of vectors, rank etc

CLO2 Describe the concepts of limit theory and nth order differential equations and their applications to physical phenomena

CLO3 Solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables.

CLO4 Describe the applications of double and triple integration in finding the area and volume of engineering solids, and explain the qualitative applications of Gauss, Stoke's and Green's theorem

CLO5 Explain ordinary differential equations and applications, and develop a mathematical model of linear differential equations, as well as appreciate the necessary and sufficient conditions for total differential equations

CLO6 Analyse basic engineering models through partial differential equations such as wave equation, heat conduction equation, etc., as well as fourier series, initial conditions and its applications to different engineering processes

Course Outline: Complex analysis – Elements of complex algebra, trigonometric, exponential and logarithmic functions. Real number, sequences and series. Composite functions, matrices and determinants. Vectors – Elements, differentiation and integration, Elements of linear algebra, Calculus – Elementary differentiation. Relevant theorems.

GNE 254 Engineering Mathematics II **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Describe physical systems using ordinary differential equations (ODEs)

CLO2 Explain the practical importance of solving ODEs, solution methods, and analytically solve a wide range of ODEs, including linear constant coefficient types.

CLO3 Numerically solve differential equations using MATLAB and other emerging applications

CLO4 Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion, as well as on functions of several variables, including directional derivatives and multiple integrals

CLO5 Solve problems using the fundamental theorem of line integrals, Green's theorem, the divergence theorem, and Stokes' theorem, and perform operations with complex numbers

CLO6 Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions of complex variables, as well as the theory of conformal mapping to solve problems from various fields of engineering

CLO7 Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula

Course Outline: Differential equations – Exact Equations. Methods for second order equations. Partial differential equation. Simple cases – Applications, Numerical Analysis – linear equations, non-linear equations. Transformation and mapping: special functions. Finite difference operators: Introduction to linear programming.

GNE 255 Applied Mechanics **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Explain the fundamental principles of applied mechanics, particularly

equilibrium analysis, friction, kinematics and momentum

CLO2 Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, mathematics and applied mechanics

CLO3 Synthesize Newtonian Physics with static analysis to determine the complete load impact (net forces, shears, torques, and bending moments) on all components (members and joints) of a given structure with a load

CLO4 Apply engineering design principles to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

Course Outline: Forces, force resolution, moments, couples, Varignon's theorem. Equilibrium of simple structures and machine parts. Friction. First and second moments of area; centroids. Kinematics of particles and rigid bodies in plane motion. Newton's laws of motion. Kinetic energy and momentum analyses.

GNE 256 Fundamental of Fluid Mechanics 2 Units

Course Learning Outcomes (CLOs):

CLO1 Explain the properties of fluids

CLO2 Determine forces in static fluids and fluids in motion

CLO3 Determine whether a floating body will be stable

CLO4 Determine the effect of various instruments, (valves, orifices, bends and elbows) on fluid flow in pipes

CLO5 Measure flow parameters with venturi meters, orifice meters, weirs, etc

CLO6 Perform calculations based on principles of mass, momentum and energy conservation

CLO7 Perform dimensional analysis and simple fluid modelling problems

CLO8 Specify the type and capacity of pumps and turbines for engineering applications

Course Outline: Nature and types of fluids; Physical properties of fluids; Fluid statics, stability of submerged and floating bodies; Fluid flow concept; conservation of mass, momentum energy; Simple applications of conservation laws; Flow measurement.

GNE 257 Fundamental of Electrical Engineering I **2 Units**

Course Learning Outcomes (CLOs):

CLO1	Discuss the fundamental concepts of electricity and electrical d.c. circuits
CLO2	State, explain and apply the basic D.C circuit theorems
CLO3	Explain the basic a.c. circuit theory
CLO4	Apply to solution of simple circuits

Course Outline: Fundamental theory of electric circuit. Direct current (DC) circuit elements. Basic circuit laws and theorems—Ohms Law, Kirchoff's Laws; Superposition, Thevenin and Norton's theorems. Nodal and loop analysis of circuits, single time-constant circuits. Steady state response of circuit elements and network. Complex impedance and admittance. Alternating current (AC) circuits impedance, admittance, susceptance, and phasor diagrams. Introduction to electronics, an overview of tubes (vacuum diode, triode and pentode). Elementary discussion of semiconductors PN junction diode and bipolar Junction Transistor. Small signal equivalent circuits.

GNE 258 Fundamental of Electrical Engineering II **2 Units**

Course Learning Outcomes (CLOs):

CLO1	Use computational tools and packages in the design of electric power systems, electronic, and digital equipment and systems
CLO2	Solve common, technical problems in the design of electronics and electrical circuits including electric power systems, and seek specialist advice as needed for more complicated problems
CLO3	Identify the process of innovation and the main factors of entrepreneurship and creative thinking, and apply methods of product development
CLO4	Apply project management methods to the planning of projects
CLO5	Plan, manage and analyse projects, using current best-practice methods
CLO6	Carry out a cost estimate for a design solution, and understand the uncertainties associated with the cost estimation process

Course Outline: Periodic waveforms and their average and effective values. Characteristics and use of non-linear elements in simple circuits. Magnetic circuits, single-phase alternating current (AC) circuits. Series and parallel resonance. Power factor correction, magnetic circuit, mutual inductance.

Introduction to electric machines, machine designs, and polyphase systems; DC generators and motors. Electrical and electronic power measuring instruments and equipment, AC and DC bridges. Basic control system, span/closed loop system. Introduction to basic communication fundaments.

GNE 259 Materials Science **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Demonstrate the role of atoms and molecules (aggregates of atoms) in the building of solid/condensed matter known as engineering materials, the electrons quantum numbers and how the electrons are arranged in different atomic elements, and explain the role of electronic configuration and valence electrons in bonding

CLO2 Define metals, alloys and metalloids, demonstrate mental picture of the solid mineral resources development as a relay race among four 'athletes': geologist, mining engineer, mineral processing technologist, process metallurgical engineer, and classify metallurgical engineering into 3Ps: process, physical and production

CLO3 Explain the relationship between structure and properties of materials,

characteristics, components and compositions of phase diagrams and phase transformations of solid solutions

CLO4 Define ceramics, glass and constituents of glasses and understand application of ceramics in mining, building, art and craft industries

CLO5 Define and classify polymers as a class of engineering materials and polymeric materials, demonstrate polymerisation reactions, their types and mechanism, and applications of polymers

CLO6 Define properties, types and application of composite materials and fibres (synthetic and natural)

CLO7 Define and classify nanomaterials, demonstrate applications of nanomaterials, concept, design and classification of fracture mechanics, corrosion classification, including the five principal ways of controlling corrosion and metal finishing processes such as sherardising, galvanising and anodizing

CLO8 Identify factors affecting the performance and service life of engineering

materials/metals and metallography of metals/materials (materials anatomy), which enables metallurgical and materials engineers to prescribe appropriate solutions to test metals/materials fitness in service through structure-property-application relationships

Course Outline: Review of properties of matter, relationships between structure and properties of metals, alloys, ceramics and plastics. Atomic and molecular structure, crystals, Metallic states, Defects in crystals, conductors, semi-conductors and insulators. Alloy theory – Application to industrial alloys – steel in particular. Engineering Properties – Their control, Hot and cold working, heat treatment, etc. Creep, fatigue and fracture. Corrosion and corrosion control. Non-metallic materials – glass, rubber, concrete, plastics, wood and ceramics. Elastic and plastic deformations: Defects in metals.

GNE 260 Strength of Materials I **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Recognise a structural system that is stable and in equilibrium
CLO2	Determine the stress-strain relation for single and composite members based on Hooke's law
CLO3	Estimate the stresses and strains in single and composite members due to temperature changes
CLO4	Evaluate the distribution of shear forces and bending moments in beams with distributed and concentrated loads
CLO5	Determine bending stresses and their use in identifying slopes and deflections in beams
CLO6	Use Mohr's circle to evaluate the normal and shear stresses in a multi-dimensional stress system and transformation of these stresses into strains
CLO7	evaluate the stresses and strains due to torsion on circular members
CLO8	determine the buckling loads of columns under various fixity conditions at the ends

Course Outline: Hooke’s law; Method of superposition; Stress and deformation resulting from temperature changes; Elastic Constants; Stress in thin cylinders and spheres; Stresses on inclined planes. Principal stresses, Mohr’s circle. Structural mechanics of statistically determinate rigid body

systems and plane pin-jointed frames; Bending moment and shear force in beams, Simple beam and deflection of beam, truss and elastic buckling of columns; Simple torsion and application; Stress and strain transformation equations.

GNE 262 Fundamentals of Thermodynamics 2 Units

Course Learning Outcomes (CLOs):

CLO1	Describe basic concepts of thermodynamics, quantitative relations of Zeroth, first, second and third laws
CLO2	Define and explain system (surrounding, closed and open system), control volume and control mass, extensive and intensive properties
CLO3	Calculate absolute and gage pressure, and absolute temperature, calculate changes in kinetic, potential, enthalpy and internal energy
CLO4	Evaluate the properties of pure substances i.e. evaluate the state of the pure substances such as compressed liquid, saturated liquid-vapour mixture and superheated vapour using property diagrams and tables; arrange the ideal and real gas equations of state
CLO5	Formulate the first law of thermodynamics for a closed system i.e. organize the change in energy in the closed systems via heat and work transfer
CLO6	Distinguish heat transfer by conduction, convection and radiation, and calculate the amount of heat energy transferred
CLO7	Calculate the changes in moving boundary work, spring work, electrical work and shaft work in closed systems
CLO8	Apply the first law of thermodynamics for closed systems and construct conservation of mass and energy equations
CLO9	Formulate the first law of thermodynamics to the open systems i.e. describe steady-flow open system, apply the first law of thermodynamics to the nozzles, diffusers, turbines, compressors, throttling valves, mixing chambers, heat exchangers, pipe and duct flow
CLO10	Construct energy and mass balance for unsteady-flow processes
CLO11	Evaluate thermodynamic applications using second law of thermodynamics

CLO12 Calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat pumps

CLO13 Restate perpetual-motion machines, reversible and irreversible processes

Course Outline: Basic concepts, quantitative relations of Zeroth, first (applications to open and closed systems; the steady State flow/ Bernoulli's equation and applications), second and third laws of thermodynamics. Behaviour of pure substances and perfect gases; Ideal gas cycles.

GNE 296 Fundamentals of Fluid Mechanics Laboratory I 1 Unit

Course Learning Outcomes (CLOs):

CLO1 Utilize basic measurement techniques of fluid mechanics

CLO2 Discuss the differences among measurement techniques, their relevance and applications

CLO3 Measure fluid pressure and relate it to flow velocity

CLO4 Demonstrate practical understanding of the various equations of Bernoulli

CLO5 Demonstrate practical understanding of friction losses in internal flows

CLO6 Demonstrate the ability to write clear lab reports

Course Outline: Determination of fluid properties. Pressure measurement. Hydrostatic force on plane surface. Determination of metacentric height. Determination of stability of floating bodies. Verification of Bernoulli's theorem.

GNE 297 Fundamentals of Electrical Eng. Laboratory I 1 Unit

Course Learning Outcomes (CLOs):

CLO1 Identify resistors and resistor colour coding

CLO2 Experimentally verify the basic circuit theorems

CLO3 Measure power and power factor in ac circuits

CLO4 Design and experiment potential diver circuits

Course Outline: Identification of resistors and resistor colour coding, Series connections, Parallel connections, Verification of Ohm's law, Verification of Kirchhoff's Voltage Law, Verification of Kirchhoff's Current Law, Loop analysis, Verification of Thevennin's Theorem, Experiment to verify

Norton's theorem, Superposition Theorem.

GNE 298 Fundamentals of Electrical Eng. Laboratory II 1 Unit

Course Learning Outcomes (CLOs):

CLO1	Demonstrate practical proficiency in Alternating current waveforms
CLO2	Design and Construction of Monostable Multivibrator
CLO3	Design and Construction of a stable Multivibrator
CLO4	Design and Construction of Bistable Multivibrator, Series and parallel Resonant Circuits
CLO5	Design and Construction of filters

Course Outline: Alternating current waveforms: Sine wave, square wave and triangular wave forms, RLC Series Circuits, RLC Parallel Circuits, Half wave rectification Circuit, Full wave rectification Circuit, Design and Construction of Monostable Multivibrator, Design and Construction of a stable Multivibrator, Design and Construction of Bistable Multivibrator, Series and parallel Resonant Circuits, Design and Construction of filters.

CSC 206 Human-Computer Interaction (HCI) 2 Units

Course Learning Outcomes (CLOs):

CLO1	Demonstrate a foundational understanding of computers, compilers, and text editors, to write code in Python
CLO2	Apply principles of heap management and efficient memory resources in avoiding memory leaks
CLO3	Design and implement subprograms to modularize code and promote code reusability
CLO4	Demonstrate proficiency in applying programming concepts to implement efficient and effective solutions
CLO5	Demonstrate an understanding of parameter parsing and function call mechanisms, passing arguments

Course Outline: Foundations of HCI, Principles of GUI toolkits; Human-centred software

evaluation and development; GUI design and programming and application programmatic interface; event driven application design and development; interaction devices; system and feedback messages, gesture recognition system, virtual relative, multimedia system, robotic etc.

GNE 351 Engineering Mathematics III **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Possess an in-depth knowledge upon which a solid foundation can be built in order to demonstrate a depth of understanding in advanced mathematical topics
CLO2	Develop simple algorithms and use computational proficiency
CLO3	Write simple proofs for theorems and their applications
CLO4	Communicate the acquired mathematical knowledge effectively in speech, writing and collaborative groups

Course Outline: Fourier series – Euler coefficients, even and odd functions, Sine and Cosine, functions, simple applications, Gamma, Beta and probability functions. Differential equation of second order– series solutions. Legendre and Bessel functions and their properties. Vector Theory – Dot product, cross product, divergence, curl and Del operators. Gradient. Line, Surface and volume integrals and related theorems.

GNE 352 Engineering Mathematics IV **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Relate integral transforms to solution of differential and integral equations
CLO2	Solve partial differential equations
CLO3	Solve second order differential equations
CLO4	Solve linear integral equations
CLO5	Explain and apply interpolation formulas
CLO6	Apply Runge-Kutta and other similar methods in solving ODE and PDEs

Course Outline: Complex variables – advanced topics, differentiation and integration of complex functions. Cauchy – Riemann equations: Related theorems. Laplace and Fourier transforms – Applications. Introduction to non-linear differential equations – stability and Applications.

GNE 354 Engineering Communication **2 Units**

Course Learning Outcomes (CLOs):

CLO1 Demonstrate the concept of clear writing, common pitfalls and unambiguous language in engineering communication, including technical reporting for different applications and emotional comportment.

CLO2 Demonstrate the skills of language flexibility, formatting, logic, data presentation styles, referencing, use of available aids, intellectual property rights, their protection, and problems in engineering communication and presentation

CLO3 Demonstrate good interpersonal communication skills through hands-on and constant practice on real-life communication issues for engineers in different sociocultural milieu for engineering designs, structural failure scenarios and presentation of reports

Course Outline: Oral communication: Public speaking skills with effective use of visual aids and statistical and technical information. Principles of effective communication in interpersonal and mass communication process. Effective reading skills- extracting main ideas and reading for specific information through speed reading. Written communication: principles of technical writing. Planning and experimental design; data collection and analysis; scientific writing and presentation. Grant writing and funding sources. Ethics and intellectual property. Professional use of English Language for letters, specification descriptions, presentation of charts, graphs, tables, writing of proposals in reports. Case studies of major engineering designs and construction/fabrication as well industrial failures; seminar presentation of reports and proposals. Project report presentation.

EEE 351 Electromagnetic Fields **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Apply Maxwell's equations to solve problems involving electric and magnetic fields

CLO2 Design and analyze electrical and electronic circuits

CLO3 Explain the operation of electromagnetic devices

CLO4 Apply electromagnetic principles to communication systems

CLO5 Analyze the electromagnetic effects of materials

CLO6 solve problems involving electromagnetic radiation

Course Outline: Review of electric fields and magnetic fields. Static field vs time-varying fields. Separation vectors. Electromagnetic laws in differential and integral forms – separation vectors, Coulomb's law, electrostatic fields due to point charges, multiple-point charges and various charge distributions. Gauss law, boundary condition, electric potential, Laplace, and Poisson equations. Magnetostatic fields, magnetostatic induction, Biot-Savart's law, magnetic flux, field strength, vector potential, magnetic field in and around current carrying conductors, conduction and displacement current. Ampere's law. Faraday's law. Lorentz law. Application examples - application of electromagnetic effects to DC & AC machines, communication and micromechanical systems. Introduction to Maxwell's equations. Design project.

EEE 352 Electrical Machines I **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Explain the Fundamentals of Electromechanical Energy Conversion

CLO2 Examine Transformer Theory and Performance

CLO3 Analyze the Design and Operation of DC Machines

CLO4 Evaluate Induction Machine Characteristics

CLO5 Understand Single-Phase and Three-Phase Machines

CLO6 Apply Fault Analysis and Protection Techniques

CLO7 Select and Apply Electrical Machines in Practical Applications

Course Outline: Electromechanical energy conversion concepts, rotating magnetic fields, magnetic circuits, magnetic coupling, mutual inductance. The focus of this course is on single phase machines. Principle of machine winding, concentrated and distributed windings, lap and wave windings. DC machines: generators, motors, shunt and series and compound wound DC machines – design, construction, flash-over, sparking, performance characteristics. Transformers: Phasor diagrams, equivalent circuits, regulation, efficiency, characteristics, design, construction, open-circuit, short-circuit test, and polarity tests. Auto-transformers, instrument transformers, single-phase, three-phase transformers, and connections. Parallel operation of transformers. Faults on machines, methods of starting and protection of machines. Induction Machines: Magnetic flux, distribution of induced EMF, equivalent circuit, power balance, and equivalent circuit referred to stator. Torque-slip characteristics for generating and motoring actions; circle diagrams. Methods of starting and speed control. Double

cage induction motor. Single phase motors. Introduction to Synchronous Machines. Motor starter circuits and motor control circuits for single-phase machines. Basic principles of selection of motors, generators and transformers for practical applications.

EEE 353 Instrumentation and Measurement 3 Units

Course Learning Outcomes (CLOs):

CLO1	Demonstrate basic meter connections in DC and AC measurements
CLO2	Understand electronic counters and their applications
CLO3	Distinguish between analog and digital data acquisition systems and understand data conversion and interfacing, digital electronic measuring system
CLO4	Explain data logging and displays, data acquisition systems, software data conversion, multiplexing, encoders, and transducers
CLO5	Demonstrate the topics taught through laboratory experiments

Course Outline: General Instrumentation, Basic Meter connections in DC measurement. Basic meter connections in AC measurements; ammeter, voltmeter, electro-dynamometer and wattmeter, instrument transformers; DC and AC bridges and their applications; general form of AC bridge universal impedance bridge; Electronic instruments for the measurement of voltage, current resistance and other circuit parameter, electronic voltmeters, AC voltmeters using rectifiers, electronic multimeter, digital voltmeters; oscilloscope, probes, sampling effects, impedance effects. Instruments for generating and analyzing waveforms; square-wave and pulse generator, signal generators, function 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. Indicating instrument; moving coil, moving iron, thermal, electrostatic, induction type instrument, I, V, kWh, PF instruments, dynamometer, frequency measurement, digital bridges, and analog electronic measuring instruments, transducers, gauges, recorders. Data conversion and interfacing. Digital electronic measuring system. Data logging and displays. Data Acquisition Systems, software Data Conversion. Multiplexing, Encoders. Transducers: analog electronic instruments for voltage, power wave-form, frequency and phase measurements. Digital instrumentation. Theory of errors: absolute and relative errors. Laboratory Practicals.

EEE 354 Electromagnetic Waves **2 Units**

Course Learning Outcomes (CLOs):

CLO1	Understand the behavior of electromagnetic waves in free space and in material media.
CLO2	Analyze wave propagation in dielectric media and good conductors.
CLO3	Explain the operation of transmission lines, waveguides, and optical fibers
CLO4	Design and analyze antennas
CLO5	Apply electromagnetic phenomena to RF, microwave, optical, and wireless communication systems
CLO6	Apply electromagnetics principles to real-world problems

Course Outline: Time-varying magnetic and electric fields; Maxwell's equation (in rectangular co-ordinates and vector- calculus notation): Derivation of Maxwell's equations; Applications of Maxwell's equations. Dielectric, conductors and ionized media. Propagation of electromagnetic waves in free space and in material media. Solution of wave equations. Speed and energy of electromagnetic waves; Poynting vector; boundary conditions, uniqueness theorem, image method. Wave propagation in dielectric media; wave propagation in good conductors, skin effect. Simple class demonstrations. Introduction to transmission lines, wave- guides and optic fibers. Transmission line theory including wave-guides, striplines, and resonators. Smith's Chart. Radiating elements. Introduction to RF design, antenna design and theory. Application examples that employ electromagnetic phenomena for signals and power transmission in RF, microwaves, optical and wireless communication systems. Design project.

EEE 355 Physical Electronics **3 Units**

CLO1	explain the nature of an atom and how it relates to the behavior of electrons in semiconductors.
CLO2	define the basic concepts of semiconductors, such as charge carriers, effective mass, mobility, conductivity, and lifetime.
CLO3	calculate the free electron motion in static electric and magnetic fields, and understand how this relates to the conductivity of crystalline solids.
CLO4	explain the theory of energy bands in conductors, insulators, and semiconductors,

and how this relates to the energy band diagram.

CLO5 describe the atomic bonding in semiconductors, and how this affects the behavior of electrons in metals and electron emissions.

CLO6 analyze the characteristics of some electronic devices, such as junction diodes, transistors, vacuum tubes, photoresistors, photocells, and light emitting diodes.

Nature of atom. Basic concepts of semi-conductors charge carriers, effective mass, mobility, conductivity life time. Free electron motion in static electric and magnetic fields, electronic structure of matter, conductivity in crystalline solids. Theory of energy bands in conductors, insulators and semi-conductors; energy band diagram; atomic bonding in semiconductors; electrons in metals and electron emissions; carriers and transport phenomena in semi-conductors; characteristics of some electronic devices – junction diodes, transistors, vacuum tubes, photoresistors, photocell and light emitting diode. Continuity equation, flow equations, Hall Effect; bipolar transistors - characteristics, CB, CC, CE configurations; switching devices. Fabrication techniques of elementary discrete devices and integrated circuit (IC) technology – BJT, MOSFETs, IGBT etc.

EEE 357 Electric Circuits **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Analyze linear circuits in the time and frequency domains

CLO2 Use Laplace transforms to solve circuit problems

CLO3 Design and analyze active and passive filters

CLO4 Analyze electromechanical circuits

CLO5 Analyze circuits with nonlinear resistors, diodes, and MOSFETs

CLO6 Solve circuit problems using MATLAB or other circuit simulation software

Course Outline: One-Port and Two-Port networks – introduction to devices and components, lumped circuit abstraction. Linear Circuits – energy storage elements, transient response of first and second-order systems, frequency domain analysis, operational amplifiers and applications. AC circuit analysis techniques, power factor, sinusoidal steady-state response, phasor analysis of AC circuits. Laplace transforms and applications to circuit analysis. Electromechanical circuits – resonance, energy transfer, Q-factor, oscillators and resonators. Active and Passive Filters – design, frequency response of low-pass, band- pass, and high-pass filters. Sallen-Key filter design. Nonlinear circuit

applications – analysis of circuits with non-linear resistors, diodes, MOSFETs. Laboratory-based Project.

ICE 301 Operating Systems **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Grasp the basic concepts of operating systems together with the modules needed to manage the different computer resources
CLO2	Describe the general architecture of computers explain basic components of an operating system
CLO3	Analyse the differences in various structures of operating systems
CLO4	Implement processes, resource control, physical and virtual memory, scheduling, I/O and files of operating systems
CLO5	Explain how a simple file system organizes data in the hard disk and know how an operating system protects the computer system

Course Outline: Early System, Simple Batch Systems, Multi-programmed and Batched Systems, Time-Sharing Systems, Personal-Computer Systems, Parallel Systems, Distributed Systems, Real-Time Systems. Computer- System Structures: Computer-System Operation, I/O Structure, Storage Structure, Storage Hierarchy, Hardware Protection, General-System Architecture. Operating System Structures: System Components, Operating-System Services, System Calls, System programs, System Structure, Virtual Machines, System Design and Implementation, system Generation. Processes, Threads, Interprocess Communication. CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real- time Scheduling, algorithm Evaluation. Deadlocks: System Model, Deadlock Characterization, methods for handling Deadlocks, Prevention, Avoidance, Detection, Recovery, Combined Approach. Memory Management: Address space, Swapping, Contiguous Allocation, Paging, Segmentation, Paged Segmentation. Virtual memory: Demand paging, page replacement, frame allocation, thrashing. File systems: File concept, Access Method, Directory Structure, Protection, File-System Structure, Allocation methods, Free-Space Management, Directory Implementation, Efficiency and Performance, Recovery. MS Windows and UNIX/LINUX architecture, applications, and programming.

ICE 302 Information System Analysis & Design 2 Units

Course Learning Outcomes (CLOs):

CLO1	Understand the basic concepts of software design, such as abstraction, refinement, and modularity
CLO2	Apply these concepts to design software that is efficient, reliable, and maintainable
CLO3	Design software that is flexible and adaptable to change
CLO4	Use different design methodologies, such as data-driven, architectural, and transformation mapping
CLO5	Design user interfaces that are user-friendly and effective design user interfaces that are user-friendly and effective
CLO6	apply object-oriented design principles to create reusable and extensible software

Course Outline: System Development Life Circle: Strategy and planning system analysis, logical design, physical design, implementation maintenance. System Development Techniques and methodologies: by Process modeling, function decomposition diagramming, Entity-Relationship diagramming, data flow diagramming, and procedure modeling. Design and Layout of forms, screens, dialoques, and report. Integrated CASE tool e.g. Oracle Designer to be used for the system development life circle. RAD tools e.g power Builder, Power Objects, visual Basic, IntraBuilder, or C++ Builder for concepts and techniques visualization.

ICE 303 Database Design and Management 2 Units

Course Learning Outcomes (CLOs):

CLO1	Define database systems concepts and design
CLO2	Explain database models and the relationships
CLO3	Describe the conceptual and physical schema of a database
CLO4	Formulate queries, and create models of different databases with SQL using inter-related tables
CLO5	Explain data warehouse concepts, methodologies and tools
CLO6	Interface assembly language programs to C programs

Course Outline: Overview of Database systems: model, schema, and instance. Database system vs. File systems. Data abstraction levels, database languages, system architecture. Classification of

DBMS. Data modeling: Entity-Relationship (ER) Model, Entities and Entity types, Relationship and Relationship type, Constraints, Weak Entity Types, ER, Diagrams. Semantic object model. Process of database design: requirement analysis, conceptual database design, database schema design. Database design using entity-relationship and semantic object models, database application design. Terminology in Relational Data model, Integrity Constraints, Primitive Operations on Relations, Relational Algebra (RA), Relational Algebra Operations, Relational Completeness, Additional Operations on Relations. Foundations of relational implementation. Structured Query Language (SQL): DML Features in SQL, DDL in SQL, updates in SQL, Views in SQL, Embedded SQL, Query-by-Example (QBE). Concurrency, recovery and security issues. Armstrong's inference rules and minimum covers, normal forms. Current trends in database systems: Client-Server database systems, Open Database connectivity (ODBC) standard, knowledge-Based Systems, Object-Based Systems, data warehousing and data mining concepts, Web databases.

ICE 304 Computer Organization and Architecture 2 Units

Course Learning Outcomes (CLOs):

CLO1	Explain the basic concepts of computer hardware and software, including the history of computing, the different types of computer architectures, and the functions of the major components of a computer system
CLO2	Distinguish between hardwired and stored program concepts, and explain the advantages and disadvantages of each
CLO3	Describe the von-neumann architecture and the harvard architecture, and explain the differences between the two
CLO4	Identify the components of a single address machine, and explain how they work together
CLO5	Describe the different types of contemporary computers, and explain their strengths and weaknesses
CLO6	Understand the basic principles of storage and input/output systems, including the fetch and execute cycle, interrupts, bus structures, memory organization, error correction, cache memory, and memory storage devices

Course Outline: Introduction to basic concepts of computer organization and design: metrics for computer performance, computer arithmetic, Von Neuman architecture, instruction implementation, control unit, pipelining, memory systems hierarchy, cache memories and basic I/O controllers.

ICE 306 Object-Oriented Programming 3 Units

Course Learning Outcomes (CLOs):

CLO1	Define and explain the basic concepts of oop, such as classes, objects, inheritance, polymorphism, and data abstraction
CLO2	Apply oop concepts to the development of java programs
CLO3	Use the java syntax and data objects to create and manipulate objects
CLO4	Write and debug java programs that use central flow constructs, objects and classes programming, arrays, and methods
CLO5	Handle exceptions and create applets
CLO6	Develop GUI programs using the abstract window toolkit (awt)

Course Outline: Basic Object-Oriented Programming (OOP) concepts: Classes, Objects, inheritance, polymorphism, Data Abstraction, tools for developing and design principles. Data types and operators associated with an OOP. Java syntax and data objects. Compiling, interpreting and debugging Java programs, Central flow constructs, objects and classes programming, Arrays, methods. Exceptions, Applets and Abstract, OLE, Persistence, development of Graphical User Interface (GUI) programs, using Abstract Window Toolkit (AWT). Thread concept: Thread methods, thread states, thread priorities and thread scheduling, thread synchronization, daemon threads, runnable interface, thread groups. Multimedia Applications: Loading, Displaying and Scaling Images, Introduction to Animation, Graphics Double Buffering, Media Tracker, Loading and Playing audio Clips, Customizing Applets, Image Maps. Network programming: Introduction, Manipulating URLs, Establishing a Simple Server, Establishing a Simple Client, Client/Server Interactions, Security and the Network. Basic engineering circuits' design using OOP.

ICE 402 Student Work Experience Programme (SWEP) 3 Units

Course Learning Outcomes (CLOs):

CLO1	Acquire industrial workplace perceptions, ethics, health and safety consciousness, inter-personal skills and technical capabilities needed to give them a sound engineering foundation
CLO2	Learn and practise basic engineering techniques and processes applicable to their specialisations

CLO3	Build circuit, devices, structures or facilities relevant to their specific engineering programmes and applications
CLO4	Acquire competence in technical documentation (log-book) and presentation (report) of their practical experiences

This will be graded by staff and the grade would be used to compute the student's result.

ICE 404 Students Industrial Work Experience (SIWES I) 3 Units

Course Learning Outcomes (CLOs):

CLO1	Demonstrate proficiency in at least any three software in their chosen career choices
CLO2	Demonstrate proficiency in some animation videos (some of which are free on YouTube) in their chosen careers
CLO3	Carry out outdoor hands-on construction activities to sharpen their skills in their chosen careers
CLO4	Demonstrate proficiency in generating data from simulations analysis
CLO5	Demonstrate proficiency in how to write engineering reports from lab work
CLO6	Fill logbooks of all experience gained in their chosen careers
CLO7	Write a general report at the end of the training

This will be graded by the industry-based supervisors and the grade returned to the University for processing/ computing the student's result.

ICE 406 Students Industrial Work Experience (SIWES II) 9 Units

Course Learning Outcomes (CLOs):

CLO1	Be exposed and prepared for the Industrial work situation they are likely to meet after graduation, by developing their occupational competencies.
CLO2	Bridge the existing gap between theory and practice of programmes through exposure to real-life situations, including machines and equipment handling, professional work methods and ethics, human relations, key performance

assessment methods, and ways of safeguarding the work environment – human and materials.

CLO3 Experience/simulate the transition phase of students from school to the world of work and the environment seamlessly, and expose them to contacts for eventual job placements after graduation

CLO4 Be motivated to identify the industrial and practice engineering challenges of their place of engagement and the larger society and creatively device impactful solutions to them.

CLO5 Exploit the opportunity to improve and utilise their acquired critical thinking and innate creativity skills during the program and SIWES Seminar presentation respectively.

Each student's report as well as the oral presentation of his or her report on work experience in the industry will be graded by the academic staff in the department. The marks obtained by the student will be used to compute his or her result.

ECT 411/ICE 409 Satellite Communication 3 Units

Course Learning Outcomes (CLOs):

CLO1 Determine the location of a satellite in space

CLO2 Explain Kepler's laws vis-à-vis their application to the location of satellite in orbit

CLO3 Differentiate between Earth segment and Space segment of a satellite communication system

CLO4 Identify the different techniques and trade-offs employed in communicating signals through a satellite

CLO5 Design a satellite uplink and downlink

Course Outline: Satellite frequency bands, services, transmission and multiplexing schemes, trans-multiplexing, multiple access schemes. Satellite orbit, satellite motion, paths, geostationary satellites, non-geostationary constellations, satellite subsystems, and satellite launching. Antennas: types, gain,pointing loss, G/T, EIRP; high power amplifiers; low noise amplifiers; BUC/LNB: conversionprocess, polarization hopping, redundancy configurations; earth station monitoring and control.Basic link analysis, attenuation, sources of interference, carrier to noise and interference ratio,system availability, frequency reuse, link budget, link design. Multiple access techniques:

companded FDM-FM-FDMA, SSB-AM-FDMA, amplitude and phase nonlinearities, optimized carrier to noise and intermodulation ratio; TDMA: frame structure, burst structure, frame efficiency, super-frame structure, frame acquisition and synchronization, satellite position determination, TDMA equipment, advanced TDMA satellite systems; CDMA: direct sequence CDMA (DS-CDMA), sequence synchronous and sequence asynchronous DS-CDMA, random access DS-CDMA, link analysis, FH-SS systems, FH-CDMA, acquisition and synchronization. Demand assignment multiple access (DAMA): types of demand assignments, DAMAcharacteristics, real time frame reconfiguration, DAMA interfaces, SCPC DAMA, SPADE,digital speech interpolation. Message transmission by FDMA: M/G/1 queue, messagetransmission by TDMA: pure ALOHA- satellite packet switching, slotted ALOHA, packet reservation, tree algorithm. Advantages and disadvantages of multibeam satellites, interconnection by transponder hopping, interconnection by on-board switching (SS/TDMA), interconnection by beam scanning, ISL: GEO-LEO, GEO-GEO, LEO-LEO, RF and optical links. VSAT networks: VSAT technologies, network configurations, multi-access and networking, network error control, polling VSAT networks.

ECT 413/ICE 505 Artificial Neural Network 3 Units

Course Learning Outcomes (CLOs):

CLO1	Student should be able to define artificial neural networks and explain their similarities to the human brain.
CLO2	Student should be able to classify different types of artificial neural networks.
CLO3	Student should be able to understand the terminology used in artificial neural networks, such as input/output sets, weights, bias, supervised learning, and network training.
CLO4	Student should be able to explain the forward and backward propagation processes in artificial neural networks.
CLO5	Student should be able to apply the gradient descent rule to train artificial neural networks.
CLO6	Student should be able to design, train, and test artificial neural networks for specific applications.

Course Outline: Neural Network: Definition of artificial neutral network (ANN). Similarities of neural networkwith human brain. Classification of ANN. Terminologies: input/output sets, weights, bias orthreshold, supervised learning, network training, Convergence process, single layer vs. multilayer perception, forward and Backward propagation, gradient descent rule. Back-

propagation neural network, Variable term used in back propagation neural network: learning rate, momentum, hidden nodes, sigmoid activation function. Back propagation algorithm of ANN. Design of ANN model, training sets for ANN, test sets for ANN, network testing and performance. Engineering applications. ANN programming.

ECT 415 /ICE 403 Data Communication and Network Applications 3 Units

Course Learning Outcomes (CLOs):

CLO1	Describe the different types of LANs and their respective media access control techniques
CLO2	Explain the differences between peer-to-peer and client-server networks
CLO3	Identify the features and benefits of major network operating systems
CLO4	Understand the TCP/IP protocol suite and its role in internetworking
CLO5	Program for the internet using the appropriate protocols
CLO6	administer and secure a network

Course Outline: Introduction to Data communications: the Development of Data communications; types andsources 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, character synchronization, synchronous transmission, asynchronous transmission, efficiency of transmission, error detection methods and data compression. Protocols: Introduction to network protocol. Seven Layer ISO-OSI standard protocols and network architecture. Transport protocols, session services protocols, and other protocols. Institute of Electrical and Electronics Engineering (IEEE) 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 recoverymechanisms. 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 & Windows NT). TCP/IP and Network OS. INTERNET: Definition, architecture, services, Internet addressing. Internet protocol, IPv4, IPv6. Internet programming, Intranet. System administration,

and security issues.

ECT 417/ICE 405 Internet Technology and Programming 3 Units

Course Learning Outcomes (CLOs):

CLO1	Itemize and explain the different types of computer security threats associated with Internet technology applications.
CLO2	Demonstrate ability to create web pages for website
CLO3	Explain the assignment of IP addresses and subnet mask
CLO4	Discuss the concept of routing
CLO5	Explain the techniques used in data security

Course Outline: Introduction to the internet, review of network technologies, transmission control protocol, addressing and routing: IP subnetting and addressing, internet routing protocols. Common internet applications: Client server concepts, DNS, Telnet, FTP, electronic email, World wide web, creating web pages, designing interactive web pages: HTML forms, Image maps, CSS, Java scripts other technologies, Internet security: intranet, extranet and firewall. Miscellaneous applications: Electronics commerce, real-time applications, IP telephony, Web crawler, search engines, Miscellaneous, Web-based mail, Proxy server, Connectivity.

GNE 451 Engineering Statistics 3 Units

Course Learning Outcomes (CLOs):

CLO1	Work with data from the point of view of knowledge convergence, machine learning, and intelligence augmentation, which significantly raises their standard for engineering analysis (the approach forces them to learn statistics in an actionable way that helps them to see the holistic importance of data analytics in modern engineering and technology).
CLO2	Anticipate the future with Artificial Intelligence while fulfilling the basic requirements of conventional engineering statistical programming consistent with their future careers.
CLO3	Perform, with proficiency, statistical inference tasks with language or programming toolboxes such as R, Python, Mathematica or MATLAB, and Design Expert to

	Summarise analysis and interpretation of industry engineering data, and make appropriate conclusions based on such experimental and/or real-life industrial data.
CLO4	Construct appropriate graphical displays of data and highlight the roles of such displays in data analysis, particularly the use of statistical software packages
CLO5	Demonstrate mastery of data analytics and statistical concepts by communicating the results of experimental and industry-case investigations, critically reasoned scientific and professional analysis through written and oral presentation

Course Outline: Elements of statistics; Descriptive statistics, frequency distribution, populations and sample, central tendency, variance data sampling, mean, median, mode, mean deviation, percentiles etc. Probability. Binomial, poison hyper- geometric, normal distributions, etc. Statistical inference intervals, tests hypothesis and significance. Estimating Engineering Quantities: Estimators Methods, Confidence Limits and Tolerance. Hypothesis testing; Statistical Inference and Engineering decision situations, operating characteristics curves, parametric and non-parametric tests of engineering data. Introduction to analysis of variance, regression. ANOVA, R-estimates, confidence intervals, correlation analysis. Statistical computer routines.

GNE 501 Engineering Management **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Understand Organizational and Management Principles
CLO2	Apply Financial and Cost Management Techniques
CLO3	Demonstrate Knowledge of Personnel Management
CLO4	Utilize Engineering Economics for Decision-Making
CLO5	Implement Production Planning and Control
CLO6	Optimize Operations Using Quantitative Techniques
CLO7	Integrate Ergonomics and Work Study in Engineering Processes

Course Outline: Principles of organization; elements of organization; management by objectives. Financial management, accounting methods, financial statements, cost planning and control, budget and budgetary control. Depreciation accounting and valuation of assets. Personnel management, selection, recruitment and training, job evaluation and merit rating. Industrial psychology. Resource management; contracts, interest formulae, rate of return. Methods of economic evaluation. Planning

decision making; forecasting, scheduling. Production control. Gantt Chart, CPM and PERT. Optimization, linear programming as an aid to decision making, transport and materials handling. Raw materials and equipment. Facility layout and location. Basic principles of work study. Principles of motion economy. Ergonomics in the design of equipment and process.

GNE 502 / GNE 552 Engineering Economics 3 Units

Course Learning Outcomes (CLOs):

CLO1	Students should be able to understand the basics of economics and finance.
CLO2	Students should be able to perform cost analysis and control.
CLO3	Students should be able to appraise investments
CLO4	Students should be able to allocate resources
CLO5	Students should be able to make decisions under uncertainty

Course Outline: Economics of business settings, costing of production systems. Objectives of cost analysis and control. Sources of finance, money and credit for projects. Investment Appraisals. Resource Allocation. Interest rates. Interest formulas and problems. Annual costs. Present worth, rates of return. Cost reducing. Depreciation accounting. Valuation of assets. Financial management; accounting methods, financial statement, elements of costing. Budget and budgeting control. Dwelling with multiple alternatives, uncertainties, planning, and decision-making procedures. Macroeconomics, Economic growth, National Income. Economic of technological change. Economic analysis of engineering projects; value systems economic decisions on capital investments and choice of engineering alternatives; new projects, replacement and abandonment policies, risky decisions; corporate financial practices. Analysis of tender and project feasibility valuation.

EEE 552 Reliability and Maintainability of Electrical Systems 2 Units

Course Learning Outcomes (CLOs):

CLO1	Understand Reliability and Maintainability Concepts
CLO2	Apply Reliability Principles to Electrical and Computer Systems
CLO3	Implement Maintenance Strategies and Fault Troubleshooting
CLO4	Evaluate Software Reliability and Quality Assurance
CLO5	Compare Hardware and Software Reliability

CLO6	Apply Quality Control and Assurance Standards
CLO7	Integrate Risk Management and Total Quality Management (TQM)

Course Outline: Introduction to reliability, maintainability, reliability specification and metrics. Application tocomputer hardware system, communication equipment, power systems, electronic components.Basic maintenance types, and procedures of computer and digital communication system. Faulttroubleshooting 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 forreliability, software safety and hazard analysis. Comparison of hardware and softwarereliability. Software Quality and Assurance: definition of software quality, software qualityfactors, 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.

EEE 519 / EEE 551 Digital Signal Processing 3 Units

Course Learning Outcomes (CLOs):

CLO1	Students should be able to understand the advantages and disadvantages of digital signal processing (DSP) over analogue signal processing.
CLO2	Students should be able to apply the sampling theorem to convert analogue signals to digital signals.
CLO3	Students should be able to quantize and encode digital signals to reduce noise and improve accuracy.
CLO4	Students should be able to use z-transforms to analyse the properties of linear time-invariant systems.
CLO5	Students should be able to design and implement FIR and IIR filters.

CLO6	Students should be able to apply DSP algorithms to signal compression and spectral analysis.

Course Outline: Introduction: Advantages of digital over analogue signal processing, problems of digitization,overview of application of DSP, basic elements of DSP system. Digital Processing of analoguesignals: Sampling of analogue signals, sampling theorem, aliasing, quantization, noise, andcoding, types and selection of ADC/DAC, Sigma-delta ADC. Analytical tools: z-transform, properties, transfer function, inverse z-transform, z-plane poles and zeros, analysis of linear time-invariant in z-domain, system stability. Discrete Fourier Analysis: Discrete Fourier Transform and properties, inverse DFT, truncated Fourier transform, windowing, FFT algorithms. Discrete Time Signals & systems: Discrete time sequences (signals), classification and determination of discrete time system, discrete time I/O description (difference equation), solution of difference equations, convolution, correlation, impulse response. Digital Filters: Definition and types. FIR filters: Transfer function, characteristics, applications, design methods, Gibb's effect and elimination, FIR filter realisation. IIR filter: Transfer function, characteristics, applications,overview of analogue filter design techniques, design methods-conversion from analogue todigital filter design techniques, IIR filter realization. Structure of Discrete Time System: Block diagram representation of constant coefficient difference equations, IIR and FIR systems andtheir basic structures, stability of discrete time systems. Software implementation of DSPalgorithms. DSP Microprocessors: Architecture, fixed point versus floating point DSP, Finiteword length effects. DSP chips: interfacing and programming. Practical application of DSP inaudio, and video.

ECT 513 / ICE 503 JAVA Technology & Programming 2 Units

Course Learning Outcomes (CLOs):

CLO1	Understand the fundamentals of the Java programming language, including syntax, data types, and control structures
CLO2	Understand the fundamentals of the Java programming language, including syntax, data types, and control structures
CLO3	Apply object-oriented programming principles to solve programming problems
CLO4	Develop proficiency in understanding, and extending the functionality of codes written in Java to solve application-specific engineering problems

CLO5	Apply Java programming concepts to develop real-world applications

Course Outline: Java programming: Java basics, Java Applets and Applications, decisions and repetitions, arrays and strings, methods and parameters. Objects and classes, encapsulation and data hiding, data abstraction and abstract data types (ADTs), inheritance, polymorphism, abstract classes and design principles, java.awt and java.awt. event packages, buttons, labels, lists, text fields and panels, mouse events and keyboard events, scrollbars and layout managers. Basics of Java exception handling, try blocks, throwing an exception, catching an exception, throws clause, constructors, finalisers and exception handling, exceptions and inheritance, finally block. Thread methods, thread states, thread priorities and thread scheduling, thread synchronization, daemon threads, runnable interface, thread groups. Multimedia Applications: Loading, Displaying and Scaling Images, Introduction to Animation, Graphics Double Buffering, Media Tracker, Loadingand Playing audio Clips, Customizing Applets, Image Maps. Network programming: Introduction, Manipulating URLS, establishing a Simple Server, Establishing a Simple Client, Client/Server Interactions, Security and the Network.

ECT 515/ICE 501 Mobile Communication & Network **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Identify and describe the various mobile radio systems, such as radio paging, cordless telephones, and cellular radio
CLO2	Describe the concepts of frequency reuse, roaming, hand-off strategies, co-channel interference, traffic, and grade of service in a cellular system
CLO3	Apply top-down design principles, program design using pseudo-code and flowcharts, and solve practical engineering problems using extensive examples and exercises.
CLO4	Develop debugging and documentation techniques for software development.
CLO5	Apply field strength prediction models for coverage estimation and analyze co-channel interference, adjacent channel interference, and near-far problems

Course Outline: Evolution of mobile radio communications. Examples of mobile radio systems: radio paging, cordless telephones, cellular radio. Trends in cellular radio and personal communications. Abasic cellular system, Frequency reuse, Roaming, Hand-off strategies, Co-

channel interference,Traffic and Grade of service, System capacity, Improving capacity of cellular system.Propagation path loss, multi-path propagation problem, Raleigh fading, Rician distribution. Doppler effect. Field strength prediction models, co-channel interference and reduction, adjacent channel interference, near-far problem. Standards and overview of analogue and digital cellular systems: AMPS, TACS, GSM, CT2, PCN, DECT, PHS. Frequency management and channel assignment, speech coding, channel coding, bandwidth consideration, equalization, modulation techniques, multiple access techniques. GSM: Architecture, elements, and standard interfaces; FDMA/TDMA structure; Speech and channel coding; time slots and bursts; signaling; hand-offs; DCS 1800; GPRS; data services over gsm. Third Generation Wireless Standard: convergence; UMTS; IMT-2000; CDMA2000; WCDMA; UWC-136; Network layer standards. Paging services and technologies; Short Message Services. Call Processing: Signaling; Roaming and mobility management; Route optimization; Wireless Intelligent Networking; Databases;Protocols; Security and billing issues. Global Positioning System: principles, and applications.

ECT 516/ICE 502 SoftwareDevelopment Technique **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Understand software development life cycle and program design
CLO2	Develop a program design using a structural language such as C
CLO3	Develop a program design using a structural language such as C
CLO4	Understand file handling concept, command line parameters, pointers to functions, creation of header files, stacks, linked lists, bitwise manipulation
CLO5	Implement software development by development applications

Course Outline: Software development life cycle. Top-Down design. Program, design using pseudo-code, flowchart. Flowchart ANSI symbols and usage. Extensive examples, and exercises using pseudo- code/flowchart to solve practical problems in engineering. Debugging and documentation techniques. Programming using a structural language such as C: Symbols, keywords, identifiers, data types, operators, various statements, operator precedence, type conversion, conditional and control structures, function, recursive functions. Arrays: 1-D, and multi-dimensional arrays, passing elements or whole array to a function. Simple sorting and searching on arrays, pointers, strings, dynamic memory allocation. Structures and Unions: Structure declaration and definition, accessing structures, array of structures, pointers and structures, union declaration,

enumerated variables. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, 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, makefile. 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.

ICE 515 Project Management **2 Units**

Course Learning Outcomes (CLOs):

CLO1	Student should be able to identify the components and features of a good computer based project management technique
CLO2	Student should be able to manage teams and their functions
CLO3	Student should be able to understand team processes, organization, and decision-making
CLO4	Student should be able to identify roles and responsibilities in a software team
CLO5	Student should be able to resolve team problems.\

Course Outline: Management Concepts. Project organization, teams, methods and tools for project management. Organization constraints on development. Project Planning Objectives, Resources, **Project** Estimation, Cost Factors, Decomposition Techniques, Estimation Models. Risk Strategies, Risk Identification, Risk Projection, Risk Monitoring and Management. Work Breakdown Structure, Task Allocation/Effort Distribution. Network Diagrams, PERT and Critical Path Method, Gantt Chart. Scheduling Strategies. Project Tracking, Controlling Progress. Quality measurement. Linear Programming and PERT/CPM applications. System Engineering, Software Development Process, Software Life Cycle, Software Metrics and Measurement.

ECT 520 Telecommunication Software Development **3 Units**

Course Learning Outcomes (CLOs):

CLO1	Understand the Fundamentals of Data Communication

CLO2	Analyze Network Protocols and Standards
CLO3	Implement Error Control and Data Compression Techniques
CLO4	Apply Client-Server Programming Concepts
CLO5	Apply Client-Server Programming Concepts
CLO6	Develop Software for Telecommunication Systems
CLO7	Utilize Flowcharts and Pseudo-code for Problem-Solving

Course Outline: Introduction to Data communications: the Development of Data Communications; types and sources of data, simple communications network, transmission definitions, one way transmission, half duplex transmission, transmission codes, transmission modes, parallel transmission, serial transmission, bit synchronization, character synchronization, character synchronization, synchronous transmission, asynchronous transmission, efficiency of transmission, error detection methods and data compression. Protocols: Introduction to network protocol. Protocols: Introduction to network protocol. Seven Layer ISO-OSI standard protocols and network architecture. Transport protocols, session services protocols, and other protocols. Institute of Electrical and Electronics Engineering (IEEE) 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: Software development life cycle. Top-Down design. Program, design using pseudo-code, flowchart. Flowchart ANSI symbols and usage. Extensive examples, and exercises using pseudo-code/flowchart to solve practical problems in engineering. Software development in C in MS Windows, UNIX/LINUX, MATLAB/Simulink environments, header file, preprocessor directives, make, makefile. Static and dynamic linking libraries. Extensive examples, and exercises programming in C and MATLAB/Simulink to solve practical problems in engineering. Exercises are to be done in the Computer Laboratory.

ECT 521 / ICE 514 Cyberpreneurship & Media Law 2 Units

Course Learning Outcomes (CLOs):

CLO1	Understand the concept of creativity in relation to entrepreneurship

CLO2	Learn the processes of business plan development
CLO3	Identify what it takes to be a Nigerian Entrepreneur
CLO4	Understand the concept of Nigerian legal system
CLO5	Analyse various communication and media acts

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

ECT 524/ICE 510 Computer Graphics & Animations 3 Units

Course Learning Outcomes (CLOs):

CLO1	Understand the concept of graphics and animation
CLO2	Identify various types of modeling techniques
CLO3	Apply graphic animation process
CLO4	Implement animation techniques

CLO5 Apply the concept of rendering in 3D modeling

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

ICE 401/ECT 523 Computer Security Techniques 2 Units

Course Learning Outcomes (CLOs):

CLO1 Itemize and explain the different types of computer security.

CO2 Demonstrate abilities to gather, analyse, and present evidence of security breaches on computing devices.

CLO3 Explain the different data encryption methods and cryptographic techniques

CLO4 Discuss the concept of Information Theory.

CLO5 Explain the techniques and the principles underlying Digital video encryption

Course Outline: History of cryptographic System, Public Key Systems, Digital Signature. Information Theory: Entropy, Perfect Secrecy, Unicity Distance, Complexity Theory, NP Completeness, NumberTheory.Data Encryption Method Ciphers, Knaspsack Ciphers, Breakable NP-Complete Knapsack, Encryption Standards DES, RSA, Elliptic Curves. Cryptographic Techniques: Blockand Stream Ciphers, Autokey, Endpoints of Encryption, One-Way Ciphers, Password andAuthentication, Secret Keys and Public Keys, Threshold Scheme. Video Scrambling techniques.Digital video encryption techniques: principle, IRDETO, Viaaccess, Videoguard, etc. Securityand Legality Issues: Copyrights, Patents, Trade Secret, Ownership of Products, Computer Crimes, Ethnical Issue in Computer Security.

ICE 504 Introduction to Enterprise Resource Planning Systems 3 Units

Course Learning Outcomes (CLOs):

CLO1	Provide a technical overview of Enterprise Resource Planning Systems and their impact on organizations
CLO2	Illustrate the concepts, fundamentals, and framework Enterprise Resource Planning System
CLO3	Implement the framework and general information technology context using SAP
CLO4	Use SAP to develop business enterprise applications
CLO5	Develop applications that solves enterprise problems

Course Outline: This course provides a technical overview of Enterprise Resource Planning Systems and their impact on organizations. Existing software package, such as SAP, should be used to illustrate the concepts, fundamentals, framework, general information technology context, the technological infrastructure, and integration of business enterprise-wide applications.

ECT 528/ICE 506 Design & Installation of Electrical & ICT Services 3 Units

Course Learning Outcomes (CLOs):

CLO1	Itemise the factors to consider in the design of a lightning for a household.
CLO2	Discuss the basic approaches used for software design.
CLO3	Describe ways to prevent glare and stroboscopic effect in fluorescent lamps.
CLO4	Mention methods used in joining conductors.
CLO5	Describe the principles of operation of the oldest sources of light.
CLO6	State the Lambert's cosine law of illumination.
CLO7	List the different light sources.

Course Outline: Electrical Installation: Induction to Health and safety at work act in Nigeria. Electrical safety.First aid. Electricity Supply regulations. Lighting and Illumination: Luminous intensity and flux. Maintenance factor. Coefficient of utilization. Types of light sources. Calculation oflighting requirements. Glare. Stroboscopic effect. Installation Materials, cables, junction box, terminations, joints. Conduits and conduiting. Truck and trucking. Electrical Installation designin domestic, commercial and industry. Alarm and emergency systems. Earthling and Protection.Purposes of earthing. Faraday cage. Rod electrodes. Earth electrode resistance.

Earthing system. Earth fault loop impedance. ICT services: NCC and FCC codes of practice andstandards. Telecommunication design and installation: Satellite, VSAT, etc. Telephone design and installation. Computer networking design and installation. Wireless LAN design and installation. Preparation of Bill of Engineering Measurement Evaluation.Contract bidding. Consultancy.

ECT 532/ICE 508 Multimedia Technology & Programming 2 Units

Course Learning Outcomes (CLOs):

CLO1	Explain the impact, applications, and state-of-the-art developments in multimedia systems.
CLO2	Describe and implement text, data, audio, image, and video processing techniques, including compression, encryption, and encoding.
CLO3	Demonstrate knowledge of audio and video formats, streaming techniques, compression standards, real-time processing, and voice recognition technologies.
CLO4	Implement image enhancement, color schemes, multiple-image handling, animation, and image compression techniques in multimedia applications
CLO5	Design and implement multimedia documents using HTML, XML, and scripting languages, incorporating URLs, protocols (HTTP, FTP, SMTP), and CGI processing
CLO6	Analyze and implement video conferencing systems, multimedia storage, presentation techniques, system integration, and real-time multimedia transmission
CLO7	Develop and manage multimedia content for intranet and internet applications, ensuring cross-platform compatibility using script languages, bytecode, and interpreters

Course Outline: Introduction: Multimedia state-of-the- art, impact of multimedia, technology, and applications. Multimedia Components: Text, data, audio, image, video. Text: Text compression anddecompression. Text coding and decoding. Multi-languages. Unicode. Data: Framing of data.Segmentation of data frames. Data formats, data encryption, data recovery, data representationand manipulation. Audio: Audio creation and encoding. Audio recording format, mono andstereo. Audio compression. Real-time audio. Audio streaming technique. Voice recognition.Image: Image formats, image color scheme, image enhancement, image processing techniques,image compression, scale of compression, multiple images, animation. Video: Video recording formats and standards, resolution, compression, video streaming techniques.

MultimediaSystems: Integration, storing and presentation of multimedia. Comparison of analogue anddigital recording. System integration and coordination. Real-time recording and transmission. Error recovery. Video conferencing systems: configuration, functions, transmission, technology. Multimedia over the networks: Hypertext: concepts. Hypertext Markup Language (HTML). HTML programming and multimedia document design. An introduction to XML. UniformResource Locators (URL). Protocols: HTTP, FTP, SMTP. Common Gateway Interface (CGI) processing. MIME specification. Script language. Platform independent language, bytecode and interpreter. Multimedia application over the Intranet and the Internet.

ICE 509 Research Methodology 1 Unit

Course Learning Outcomes (CLOs):

CLO1 Explain the principles of research design, problem identification, qualitative and quantitative research methods, and measurement techniques

CLO2 Demonstrate knowledge of sampling methods, data analysis, interpretation, and technical report writing.

CLO3 Effectively use encyclopedias, research guides, handbooks, academic databases, and reference management software for scholarly research

CLO4 Apply plagiarism detection software and adhere to ethical research practices in academic and professional settings.

Course Outline: Foundations of research; problem identification and formulation; research design; qualitative and quantitative research; measurement; sampling; data analysis; interpretation of data and technical report writing; use of encyclopedias, research guides, handbook etc., academic databases for computing discipline; use of tools/techniques for research: reference management software, software for detection of plagiarism.

ECT 533/ICE 513 Random Processes & Queue Theory 2 Units

Course Learning Outcomes (CLOs):

CLO1 Demonstrate a comprehensive understanding of basic probability concepts, including conditional and total probability, and their application in solving probabilistic problems

CLO2 Evaluate and interpret the application of random signal theory in real-world scenarios, identifying its relevance and significance in various communication systems and signal processing applications

CLO3 Understand and analyze the concepts of Poisson points, renewals, and queueing theory, and their applications in modelling and analyzing random processes.

CLO4 Apply the concepts of distribution and density functions to model and analyze random variables, both single and multiple, and their associated probability distribution.

CLO5 Evaluate and interpret the application of random signal theory in real-world scenarios, identifying its relevance and significance in various communication systems and signal processing applications.

Course Outline: Review of probability: Basic concepts. Conditional and total probability. Distribution anddensity functions. Random variables: single and multiple variables. Mean variance and moments.Basic concepts, definition, and classification of random processes. Stationary process andindependence property. Autocorrelation and correlation functions. Ergodicity. Power density spectrum. Linear systems. Hilbert Transforms. Noise modelling. Linear system response torandom signal. Narrowband, band-limited and bandpass processes. Optimum linear systems:matched filter for white noise and coloured noise, Wiener filters, minimum mean-squared error.Optimization by parameter selection. Poisson points and renewals. Queueing theory. Shot noise. Markov processes. Applications of random signal theory in communications: AM system andnoise performance, FM system and noise performance, noise in a phase-locked loop, radardetection: false alarm probability and threshold detection probability.

ECT 535/ICE 407 Data Structures & Algorithm 2 Units

Course Learning Outcomes (CLOs):

CLO1 Understand the basic data structures and algorithms used in computer science. This includes data structures such as linked lists, trees, and hash tables, as well as algorithms such as sorting, searching, and selection.

CLO2 Analyze the efficiency of algorithms. This includes being able to determine the worst-case, average-case, and best-case time and space complexity of algorithms.

CLO3 Design algorithms. This includes being able to use divide-and-conquer, dynamic programming, greedy algorithms, and other techniques to design efficient

algorithms.

CLO4 Implement algorithms in C/C++. This includes being able to use the data structures and algorithms learned in the course to write efficient C/C++ code.

CLO5 Apply data structures and algorithms to real-world problems. This includes being able to use the knowledge learned in the course to solve problems in areas such as networking, data mining, and artificial intelligence.

CLO6 Communicate effectively about data structures and algorithms. This includes being able to explain the concepts learned in the course to others, both verbally and in writing.

Course Outline: Data Types and ADT: Data types, Arrays & Pointers, Data structures, ADTs & implementation, objects, classes. Programming language support for ADTs. Data Structures: stacks: implementation & linked stacks. Recursion: Backtracking & Look-Ahead. Queues: circular, linked. Polynomial arithmetic. List and strings. Searching and Sorting: "Big O" notation. Sequential search, binary search, comparison trees, Insertion sorts, election sort, shell sort,quicksort, mergesort, Radix sort & Heapsort. Hashing. Analysis of these searching and sorting techniques. Trees: Binary trees. Traversal of binary tree. Binary search trees: Insertion and deletion & building binary trees. Height balance. Multiway trees. Polish Notation. Graph ADT, Graph traversal, depth-first & breadth-first algorithms. Shortest Paths, best-first, uniform-costtraversals.

EEE 532 Object-Oriented Design and Programming 3 Units

Course Learning Outcomes (CLOs):

CLO1 Understand and Apply Object-Oriented Programming (OOP) Concepts

CLO2 Utilize Java syntax, operators, flow control constructs, arrays, and methods while compiling, interpreting, and debugging Java applications.

CLO3 Apply exception handling, applets, abstract classes, Object Linking and Embedding (OLE), and persistence in Java-based applications.

CLO4 Develop object-oriented programs for basic engineering circuit design and simulation

Course Outline: Basic Object-Oriented Programming (OOP) concepts: Classes, Objects, inheritance, polymorphism, Data Abstraction, tools for developing. Compiling, interpreting and debugging, Java programs, Java syntax and data objects, operators. Central flow constructs, objects and classes programming, Arrays, methods. Exceptions, Applets and Abstract, OLE, Persistence,

Window Toolkit. Basic engineering circuits' design using OOP.

EEE 539 / 559 Telecommunication Engineering 2 Units

Course Learning Outcomes (CLOs):

CLO1	Explain the Fundamentals of Cable Telegraphy and Telephony
CLO2	Describe how telegraph codes, radio systems, and terminal equipment like teleprinters, relays, and repeaters function in communication networks
CLO3	Explain the working principles of telephone receivers, crossbar and electronic switching systems, as well as PBX and PABX systems.
CLO4	Evaluate the different transmission standards used in telephony and how they impact network performance.
CLO5	Describe the Structure of Telephone Networks

Course Outline: Cable telegraphy and telephony characteristics, cross talk, equation, Poleliness, aerial and underground cables. Telegraph systems: codes, radio systems, terminal equipment (teleprinters, relays, switching systems, repeaters). Telephone receivers, switching (crossbar, electronic switches), PBX, PABX, Transmission standards, Telephone network structure.

ECT 590/ICE 511 Final Year Project I 3 Units

Course Learning Outcomes (CLOs):

CLO1	Students should be able to review literature and observe local environment
CLO2	Students should be able to identify gap from literature or problem that needs solution from local environment.
CLO3	Students should be able to conceptualise a project topic to capture the gap identified.
CLO4	Students should be able to outline aim and objectives needed to fill the gap or solve the problem.

CLO5 Students should be able to outline workable methodology based on knowledge gathered so far from courses taken and literature

Course Outline: Final year students' individual or group projects in one of the several areas of Information and Communication Technology, under the supervision of the academic staff of the Department or School. These independent projects may involve literature research, design, fabrication, construction or feasibility studies. The student is required to plan and carry out the project under the supervision of academic member of staff. A formal report of the project is required at the end of the second semester. The student is required to present his/her results orally before a panel of examiners.

ECT 590/ICE 512 Final Year Project II **3 Units**

Course Learning Outcomes (CLOs):

CLO1 Students should be able to perform each of the outlined methods to achieve the stated objectives.

CLO2 Students should be able to perform evaluation and testing of the solution derived.

CLO3 Students should be able to document process and results gotten.

CLO4 Students should be able to determine if project is environmentally friendly.

Course Outline: Final year students' individual or group projects in one of the several areas of Information and Communication Technology, under the supervision of the academic staff of the Department or School. These independent projects may involve literature research, design, fabrication, construction or feasibility studies. The student is required to plan and carry out the project under the supervision of academic member of staff. A formal report of the project is required at the end of the second semester. The student is required to present his/her results orally before a panel of examiners.

ECE 526 Robotic & Automation **2 Units**

Course Learning Outcomes (CLOs):

CLO1 Understand the Fundamentals of Robotics and Automation

CLO2	Apply Kinematics and Dynamics to Robot Motion
CLO3	Utilize automation sensors, robot vision, end-of-arm tooling, and various control strategies, including fuzzy logic and AI-based robot control
CLO4	Evaluate Automation in Manufacturing and Production
CLO5	Design and configure robot control circuits, program task-oriented robot functions, and integrate robotic systems within automated environments.

Course Outline: Robot classification and manipulation. Technology and history of development of robots. Applications. Direct and inverse kinematics: arm equation. Workspace analysis and trajectory planning. Differential motion and statics. Manipulator dynamics. End-of arm tooling. Automation sensors. Robot vision. Work-cell support systems. Robot and system integration. Safety. Human interface. Robot control system. Circuit and system configuration. Task oriented control. Robot control programming. Fuzzy logic and AI based robot control. Fundamentals of automation. Strategies and economic consideration. Integration of systems. Impact to the production factory. Evaluation of conventional processes. Analysis of automated flow lines. Assembly systems and line balancing. Automated assembly systems. Numerical control and adaptive control. Robot applications. Automated materials handling and storage systems. Automation in inspection and testing. Linear feedback control system. Optimal control. Computer process control. Computer integrated manufacturing systems. Future automated factory.