NATIONAL BOARD FOR TECHNICAL EDUCATION

CURRICULUM AND COURSE SPECIFICATIONS

NATIONAL DIPLOMA

IN

COMPUTER ENGINEERING TECHNOLOGY

DECEMBER, 2020

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8. List of Participants

GENERAL INFORMATION

1.0 CERTIFICATION AND TITLE OF THE PROGRAMME:
The certificate to be awarded and the programme title shall read: "NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY"

2.0 GOAL AND OBJECTIVES
The National Diploma Programme in Computer Engineering Technology is designed to produce computer technicians to install, maintain and repair computer system software, hardware and its peripherals. More specifically, diplomates of the programme should be able to:

a) Map out the layout for computers installation and networking;
b) Set up the installation, configuration and the operation of a computer system(s);
c) Set up the installation, configuration and the operation of computer networks;
d) Use appropriate instruments and software to carry out simple tests and measurements on all subsystems in a computer and its peripherals;
e) Carry out routine maintenance and repair of:
    i. Computer Hardware;
    ii. Computer Software; and
    iii. Computer Peripherals.
f) Construct simple computer circuit;
g) Develop simple programming codes;
h) Present technical reports; and
i) Manage a small enterprise.

3.0 ENTRY REQUIREMENTS
Entry requirements for the National Diploma in Computer Engineering Technology programme include at least a minimum score in the Unified Tertiary Matriculation Examination (UTME), five credit passes at not more than two sittings in West African Senior School Certificate of Education (WASSCE), Senior School Certificate of Education (SSCE), National Technical Certificate (NTC), General Certificate of Education (GCE) Ordinary level, West African Examination Certificate (WAEC) or National Examination Council (NECO) in relevant subjects. The relevant subjects are: English Language, Mathematics, Physics, Chemistry and one other subject from: Metal Work, Wood Work, Technical Drawing, Basic Electronics, Basic Electricity,

Economics, Commerce, Statistics, Further Mathematics, Computer Studies, Geography and Biology or Agricultural Science. (Details of Admission requirements are obtainable in the NBTE annual Directory of Accredited Programmes).

4.0 CURRICULUM

4.1 The curriculum of all ND programmes consists of the following four main components:

i. General Studies/Education
ii. Foundation courses
iii. Professional courses
iv. Supervised Industrial Work Experience Scheme (SIWES)

4.2 The General Education Components shall include courses in:

- Art and Humanities – English Language, Communication, History
- Social Studies – Citizenship Education, Political Science, Sociology, Philosophy, Geography and Entrepreneurship Studies

The General Education component shall account for not more than 10 - 15% of total contact hours for the programme.

4.3 Foundation Courses include courses in Mathematics, Pure Science, Technical Drawing etc. The number of hours will be 10 - 15% of the total contact hours.

4.4 Professional Courses are courses that give the student theory and practical skills he needed to practice at the Technician level. These may account for 60-70% of the contact hours.

4.5 Student Industrial Work Experience Scheme (SIWES) shall be taken during the long vacation following the end of the second semester of the first year. See details of SIWES at paragraph 9.0.

5.0 CURRICULUM STRUCTURE:

The structure of the ND Programme consists of four (4) semesters of classroom, laboratory and workshop activities in the Institution and a semester (3-4 months) of student industrial work experience scheme (SIWES). Each semester shall be seventeen (17) weeks of duration made up of:

- 15 contact weeks of teaching, i.e. recitation, practical exercises, quizzes, test, etc; and
- 2 weeks for examinations and registration.

SIWES shall take place at the end of the second semester of the first year.

6.0 PROJECT

Project shall be submitted at the end of the second semester of the final year.

7.0 ACCREDITATION

Each programme offered either at the ND or HND level shall be accredited by the NBTE before the diplomates can be awarded either of the two diploma certificates. Details about the process of accrediting a programme for the award of ND or HND are available from the Executive Secretary, National Board for Technical Education, Plot B Bida Road, P.M.B. 2239, Kaduna, Nigeria.

7.1 Conditions for the Award of ND:

Institutions offering accredited programmes will award the National Diploma to candidates who successfully completed the programme after passing prescribed course-work, examinations, diploma project and the supervised industrial work experience. Such candidates should have completed a minimum of 90 and 100 semester credit units. National Diploma Certificateshall be awarded based on the following:-

i. Grading of Courses: Courses shall be graded as follows:

MARKED RANGE	LETTER GRADE	WEIGHTING
75% and above	A	4.00
70% – 74%	AB	3.50
65% – 69%	B	3.25
60% – 64%	BC	3.00
55% – 59%	C	2.75
50% – 54%	CD	2.50
45% – 49%	D	2.25
40% – 44%	E	2.00
Below 40%	F	0.0

ii. Classification of Diplomas: Diploma Certificates shall be awarded based on the following classifications:

Distinction - CGPA 3.50-4.00
Upper Credit - CGPA 3.00-3.49
Lower Credit - CGPA 2.50-3.00
Pass - CGPA 2.00-2.49

8.0 GUIDANCE NOTES FOR TEACHERS OF THE PROGRAMME:

8.1 The new curriculum is drawn in unit courses. This is in keeping with the provisions of the National Policy on Education which stress the need to introduce the semester credit units which will enable a student, who so wish, to transfer the units already completed in an institution of similar standard from which he is transferring.

8.2 In designing the units, the principle of the modular system by product has been adopted, thus making each of the professional modules, when completed provides the student with technician operative skills, which can be used for employment purposes

8.3 As the success of the credit unit system depends on the articulation of programmes between the institution and industry, the Curriculum content has been written in behavioral objectives, so that it is clear to all the expected performance of the student who successfully completed some of the courses or the diplomates of the programme. There is a slight departure in the presentation of the performance based curriculum which requires the conditions under which the performance is expected to be carried out and the criteria for the acceptable levels of performance. It is a deliberate attempt to further involve the staff of the department teaching the programme to write their own curriculum stating the conditions existing in their institution under which the performance can take place and follow that with the criteria for determining an acceptable level of performance. The Academic Board of the institution may vet departmental submission on the final curriculum. Our aim is to continue to see to it that a solid internal Evaluation system exist in each institution for ensuring minimum standard and quality of education in the programmes offered throughout the polytechnic system.

8.4 The teaching of the theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional courses and laboratory work should not be taught in isolation from the theory. For each course, there should be a balance of theory to practice in the ratio of 50:50 or 60:40 or the reverse.

8.5 To be considered a specialist teaching this programme, the instructor / lecturer must possess qualifications in COMPUTER ENGINEERING or related engineering disciplines, e,g. Electronics, Telecommunication, Control, etc.

8.6 SYNOPSIS OF THE ACADEMIC & CAREER PROGRESSION OF ND HOLDER
He/She

1. Can be admitted into HND programmes e.g Computer Engineering, Electronics and Telecommunication
2. Can be admitted through direct entry (DE) into bachelor's degree programmes
3. Can work as a technician
4. Can manage a small scale computer-based firms, business centres and any other related enterprise(s)

9.0 GUIDELINES ON SIWES PROGRAMME:

For the smooth operation of the SIWES the following guidelines shall apply

9.1 Responsibility for placement of students

a) Institutions offering the ND programme shall arrange to place the students in industry by April 30 of each year, six copies of the list showing where each student has been placed shall be submitted to the Executive Secretary, NBTE which shall in turn, authenticate the list and forward it to the industrial training fund, Jos
b) The placement Officer should Explain and agree with industry on the following:
    i. A task inventory of what the students should be expected to experience during the period of attachment. It may be wise to adopt the one already approved for each field
    ii. The industry-based supervisor of the students during the period, likewise the institution based supervisor
    iii. The evaluation of the student during the period. It should be noted that the final grading of the student during the period of the attachment should be weighted more on the evaluation by his industry-based supervisor

9.2 Evaluation of students during the SIWES

In the evaluation of the student, cognizance should be taken of the following items:

a) Punctuality
b) Attendance
c) General Attitude to Work
d) Respect for Authority
e) Interest in the Field/Technical area
f) Technical competence as a potential technician in his field

9.3 Grading of SIWES

To ensure uniformity of grading scales, the institution should ensure that the uniform grading of student's work, which has been agreed to by polytechnics, is adopted.

9.4 The Institution Based Supervisor

The Institution-based supervisor should initiate the logbook during each visit. This will enable him to check and determine to what extent the objective of the scheme are being met and to assist students having any problems regarding the specific assignments given to them by their industry-based supervisor.

9.5 Frequency of Visit

Institution should ensure that students placed on attachment are visited within one month of their placement. Other visits shall be arranged so that:

1) There is another visit six weeks after the first; and
2) A final visit in the last month of the attachment

9.6 Stipends for Students in SIWES

The rate of stipend payable shall be determined from time to time by the Federal Government after due consultation with the Federal Ministry of Education, the Industrial Training Fund and the NBTE

9.7 SIWES as a Component of the Curriculum

The completion of SIWES is important in the final determination of whether the student is successful in the programme or not. Failure in the SIWES isan indication that the student has not shown sufficient interest in the field or has no potential to become a skilled technician in his field. The SIWES should be graded on a fail or pass basis. Where a student has satisfied all other requirements but failed SIWES, he may only be allowed to repeat another four months SIWES at his own expense.

CURRICULUM TABLE

ND 1 SEMESTER 1

S/N	CODE	COURSE TITLE	L	P	CU	CH
1.	GNS 101	Use of English I	2	0	2	2
2.	GNS 127	Citizenship Education I	2	0	2	2
3.	MTH 112	Algebra and Elementary Trigonometry	1	0	2	3
4.	MEC 101	Technical Drawing	1	2	3	3
5.	MEC 113	Basic Workshop Technology and Practice	1	2	3	3
6.	EEC 115	Electrical Engineering Science I	1	2	3	3
7.	CTE 111	Introduction to Computers & Information Technology	1	2	3	3
8.	CTE 112	Electrical Workshop Practice and Technology	1	1	3	2
9.	CTE 113	Computer Application Packages	1	1	3	2
10.	CTE 114	Internet and Web Technologies	1	2	2	3
11.	CTE 115	Data Structures	1	1	2	2
TOTAL			13	13	28	27

ND 1 SEMESTER 2

S/N	CODE	COURSE TITLE	L	P	CU	CH
1.	GNS 102	Communication in English I	2	0	2	2
2.	GNS 128	Citizenship Education II	2	0	2	2
3.	MTH 211	Calculus	1	0	1	1
4.	MEC 102	Machines Tools Technology and Practice	1	2	3	3
5.	EED 126	Introduction to Entrepreneurship	1	2	3	3
6.	EEC 124	Electronics I	1	2	3	3
7.	EEC 125	Electrical Engineering Science II	1	2	3	3
8.	CTE 121	Digital Computer Fundamentals I	1	2	3	3
9.	CTE 122	Electrical Measurement and Instrumentation I	1	2	3	3
10.	CTE 123	Computer/Electronic Maintenance and Repairs	1	2	3	3
11.	CTE 124	Technical Report Writing	2	0	2	2
TOTAL			14	14	28	28

ND 2 SEMESTER 3

S/N	CODE	COURSE TITLE	L	P	CU	CH
1.	GNS 201	Use of English II	2	0	2	2
2.	MTH 202	Logic and Linear Algebra	1	0	2	2
3.	EED 216	Practice of Entrepreneurship	1	1	2	2
4.	EEC 234	Electronics II	1	2	3	3
5.	EEC 239	Electrical Circuit Theory I	1	0	2	2
6.	CTE 231	Micro Computer Fundamentals	1	2	3	3
7.	CTE 232	Computer Workshop Practice I	1	2	3	3
8.	CTE 233	Digital Computer Fundamentals II	1	2	3	3
9.	CTE 234	Computer Architecture I	1	2	3	3
10.	CTE 235	Electrical Measurement and Instrumentation II	1	2	3	3
11.	CTE 236	Introduction to Visual Basic Programming	1	1	2	2
TOTAL			12	14	28	28

ND 2 SEMESTER 4

S/N	CODE	COURSE TITLE	L	P	CU	CH
1.	GNS 202	Communication in English II	2	0	2	2
2.	MTH 122	Trigonometry and Analytical Geometry	1	0	2	2
3.	EEC 249	Electrical Circuit Theory II	1	0	2	2
4.	CTE 241	Introduction to Micro-processors and Assembly Language	1	2	3	3
5.	CTE 242	Computer Workshop Practice II	1	2	3	3
6.	CTE 243	Operating Systems I	2	0	2	2
7.	CTE 244	Computer Networking	1	2	3	3
8.	CTE 245	Telecommunication Engineering I	1	2	3	3
9.	CTE 246	Project	0	6	6	6
TOTAL			10	14	24	24

L = LECTURE HOURS P = PRACTICAL HOURS
CU = CREDIT UNIT
CH = CONTACT HOURS

ND I FIRST SEMESTER

Programme: National Diploma in Computer Engineering Technology	Course Code: EEC 115	Contact Hour: 45
Course: ELECTRICAL ENGINEERING SCIENCE I	Semester 1	Theoretical: 1 hr/week
Year I	Pre-requisite:	Practical: 2 HR/Week
Goal: this course is intended to provide students with basic knowledge of Electrical Engineering Science		
General Objectives: On completion of this course the student should be able to: 1. Understand the concept of electric current flow. 2. Understand simple d.c. circuits. 3. Understand various types of energy and their inter-relationship. 4. Understand the concept of electrostatics, electric charge and capacitance of capacitors.		

	Theoretical Content			Practical Content		
General Objective 1: Understand the concept of electric current flow						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-3	1.1 Define an atom. 1.2 Explain the structure and composition of an atom. 1.3 Differentiate between conductors, insulators and semi-conductors. 1.4 Explain the concepts of current and electron flow. 1.5 Define electric current, potential difference, electromotive force (e.m.f) and resistance, their units and symbols. 1.6 State multiples and sub-multiples of Electric quantities; (e.g. Mega (M) - 10^6, kilo (K) - 10^3, etc).	• Draw atomic structure to explain its composition to the students • Explain the electron mobility • Draw the atomic structure to explain the unique differences in their structure. • Explain with the aid of diagrams how the current & electron flow. • Write down the formulae and symbols for current flow, p.d. or e.m.f., resistance. • Explain the formula and symbols to the students. • Explain quantities of electricity and their units	White Board, textbooks, lecture notes, Internet sites, PC loaded with Presentation software package and connected to multimedia Projector, calculator			Explain the concepts of current and electron flow and electric current, List potential difference between electromotive force (e.m.f) and resistance. Write out their units and symbols
General Objective 2: Understand simple d.c. circuits						
4-9	2.1 Define d.c. current.	• State the definition	White Board,	2.1 Perform	• Explain the	Explain the following:

	2.2 State the analogy between current-flow, and water flow. 2.3 Describe basic d.c. circuits. 2.4 Explain ohm's law. 2.5 Solve problem using ohm's law. 2.6 Define resistivity and conductivity of a conductor. 2.7 State the relationship between resistance of a conductor, its resistivity, length and area. 2.8 Differentiate between series and parallel circuits. 2.9 Solve problems involving resistivity and conductivity 2.10 Deduce the equivalent resistance of series and parallel circuits. 2.11 Explain Kirchhoff's laws. 2.12 Explain the super position principles. 2.13 Solve problems involving series and parallel circuits using kirchff's laws and superposition principles. 2.14 Define temperature coefficient of resistance.	of current. Explain how flow of current is similar to the flow of water. • Draw the basic d.c circuit with source. • Explain the flow of current. • Use diagrams to explain Ohms law. • Give examples of some circuits with resistive components. • Explain how to obtain resistivity and conductivity from the formula R = ρ1/a • Explain how to obtain resistivity from the formula R =ρ1/a • Draw the circuit diagrams for series and parallel connections. • Explain the differences between the Kirchhoff's laws and superposition principles. Give examples. • Explain the relationship	textbooks, lecture notes, Internet sites, PC loaded with Presentation software package and connected to multimedia Projector, calculator	experiment on a single loop d.c circuit with variable e.m.f 2.2 Verify Ohm's law 2.3 Verify by experiment the resistivity of a material. 2.4 Carry out experiments on series and parallel circuits. 2.5 Verify Kirchhoff's law with d.c circuits. 2.6 Verify superposition principles. 2.7 Determine by experiment the temperature coefficient of resistance. 2.8 Verify by experiment the heating effect of electric current	procedures to be followed to the students • Identify the set of equipment to be used for each experiment • Relate the theory to with the experiments to be performed • Assign students into groups • Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments	-Basic Electricity Trainers, Electronic Trainers, Oscilloscopes, Digital/Analogue Multimeters, Ammeters, Voltmeters, Potentiometers, Wheatstone bridges, Rheostats, Variacs, Wattmeters

	2.15 Use the expression for resistance at temperature T^0k and to O^0k to calculate changes in resistance. 2.16 Draw the graph of resistance against temperature. 2.17 Deduce from 2.15 the change in resistance due to change in temperature. 2.18 Solve problems involving effect of temperature on resistance.	between the temperature and resistance of a wire. • Show how to calculate a change in resistance when the temp changes. • Explain why there is a temperature change when the current flows through a wire. • Show a typical graph of resistance against temperature				
General Objective 3: Understand various types of energy and their inter-relationship						
10-11	3.1 Explain various types of energy. 3.2 Explain the relationship between electrical, mechanical and thermal energy. 3.3 State S.I. units of various types of energy in 3.2. 3.4 State Joule' law. 3.5 Solve problems involving Joule's law.	• Explain the sources of various energy generations. • Show how they are related to electrical energy • Revise the importance and types and of energy with the students	White Board, textbooks, lecture notes, Internet sites, PC loaded with Presentation software package and connected to multimedia Projector, calculator	3.1 Determine by experiment power in a d.c. circuit. 3.2 Verify Joules' law	• Explain the procedures to be followed to the students • Identify the set of equipment to be used for each experiment • Relate the theory to with the experiments to be performed • Assign students into groups	Differentiates between the following: Basic Electricity Trainers, Oscilloscopes, Digital/Analogue Multimeters, Ammeters, Voltmeters, Potentiometers, Wheatstone bridges, Rheostat, Variac, Wattmeter
General Objective 4: Understand the concept of electrostatics, electric change and capacitance of capacitor						
12-15	4.1 Explain electric charge.	• Explain sources of	White Board,	4.1 Determine	• Provide	Basic Electricity

	4.2 State unit of electric charges. 4.3 State Coulomb's law. 4.4 Solve problems involving coulomb's law. 4.5 Define electric field strength, electric flux density, permittivity, relative permittivity, field intensity, potential and electric flux. 4.6 Solve problems involving the terms in 4.5. 4.7 Define capacitance. 4.8 Derive an expression for the capacitance of parallel plate capacitors in terms of area, the distance between plates and composite dielectrics. 4.9 Derive an expression for the capacitance of a capacitor with composite dielectric. 4.10 Derive an expression for the voltage distribution between series connected capacitors. 4.11 Deduce an expression for the equivalent capacitance for capacitors connected in series and in parallel. 4.12 Derive an expression for the energy stored in a capacitor.	electric charges and electrostatic charges • Explain the mathematical formula for the electric charge, electrostatic charges. • Explain energy stored in Capacitor • Use analytical methods and scientific software to solve problems	textbooks, lecture notes, Internet sites, PC loaded with Presentation software package and connected to multimedia Projector, calculator	by experiments charging and discharging of a capacitor.	practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments • Encourage students to be creative and innovative in their practical works	Trainers, Electronic Trainers, Oscilloscopes, Digital/Analogue Multimeters, Ammeters, Voltmeters, Potentiometers, Wheatstone bridges, Rheostats, Variacs, Wattmeter

	4.13 Solve problems involving 4.8 to 4.12.					

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

Programme: National Diploma in Computer Engineering Technology	Course Code: CTE 111	Contact Hours: 45 Hrs
Course: INTRODUCTION TO COMPUTERS AND INFORMATION TECHNOLOGY	Semester: 1	Theoretical: 1 hour /week
Year: 1	Pre-requisite:	Practical: 2 hours /week
Goal: This course is designed to enable students to acquire basic knowledge of computers, Information Technology and digital economy		
General Objectives: On completion of this course the students should be able to: 1. Understand the history, classification and impact of computers. 2. Know the **c**oncept and management Information Technologies 3. Understand the fundamentals of computer hardware 4. Know the basics, uses and types of computer software 5. Understand security and safety procedures within a computer environment 6. Understand the concept of a computer network		

7. Understand the principles and uses of the internet technologies
8. Understand mobile & wireless and pervasive computing
9. Know IT Ethics and impacts of IT on the society

	General Objective 1.0: Understand the history, classification and impact of computers.					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Evaluation**
1	1.1 Define computer. 1.2 Describe the basic components of the computer systems. 1.3 Describe the development of computers, in particular: Abacus, Pascal, Babbage, Hollerith, ENIAC etc. 1.4 Classify computers according to generations from 1st – 5th generation (any subsequent generation). 1.5 Distinguish between analogue, digital and hybrid computers. 1.6 Classify computer by size and purpose . 1.7 List the benefits of computers to the society. 1.8 Explain the social implication of computers on society in particular privacies and quality of life.	• Define computer and computer systems • Trace the history of computer. • Classify the computer according to generations • Explain types and classes of computers. • Explain the benefits and implications of computers to the society.	White Board. Charts, PC loaded with Presentation software package and connected to multimedia Projector	Identify computer systems. Identify different classes of computer	Guide students to identify computer systems Guide students in the identification of computer systems	Describe the history and generations of computers? Classify computer by type, size and purpose
2	**General Objective 2.0: Know the c**oncept and management Information Technologies					
	2.1 Explain the concept of Information Systems: 2.2 Describe the architecture of					

	Information Technology. 2.3 Explain Information Technology Infrastructure. 2.4 Describe Computer Based Information Systems. 2.5 Explain the differences among data, information, and knowledge. 2.6 State examples of Information Systems. 2.7 Explain the features of modern computing environment. 2.8 Explain web-based systems in organisations and their importance.					
	General Objective 3.0: Understand the fundamentals of computer hardware					
3	3.1 Explain elements of computer systems. 3.2 Describe computer hardware components. 3.3 Describe three major components of computer hardware (input, processing and output). 3.4 Describe the functions of the peripheral devices. 3.5 Describe the function of C.P.U. 3.6 List some auxiliary	• Explain the meaning of hardware, its various components and functions • Explain various peripheral devices and their functions • Explain the functions of CPU and its components.	White Board. Charts, PC loaded with Presentation software package and connected to multimedia Projector	Identify the various components of a computer system Identify the various auxiliary units and distinguish between the memory sizes	Guide students to identify the various component of a computer system Guide the students on how to identify the various auxiliary units	List the components of computer system and their various functions. What are the various measurement units of memory?

	units. 3.7 Describe the function of the auxiliary memory 3.8 Define bits, byte, nibble, and word nd storage size. 3.9 Explain the following computer hierarchy: - Supercomputers - Mainframe Computers - Workstations - Microcomputers 3.10 Describe how to select and specify computer.	• Explain the auxiliary memory • Explain measurement of storage				
	General Objective 4.0: Know the basics, uses and types of computer software					
4	4.1 Explain software and its various types. 4.2 Highlight the significance of software in computer systems. 4.3 Distinguish between the machine level, low – level and high – level languages. 4.4 Explain source and object programs. 4.5 Define a translator. 4.6 Explain types of translators: assembler, compiler, and interpreter. 4.7 Explain the use of bespoke application packages and user	• Explain system software and application software. • Explain the different levels of languages used in computers. • Explain the various types of translators and their functions. • Explain computer packages and user application software	White Board. Charts, PC loaded with Presentation software package and connected to multimedia Projector	• Identify various translators and computer packages on computer system	Guide the students on how to differentiate between different levels of languages. Guide students on how to identify various translators and computer packages on computer systems	What are the levels associated with a source and object code respectively? Differentiate the three translators and be able to identify the different application software.

	application software programs. 4.8 Explain software evaluation and selection 4.9 Explain Software Licensing Upgrade and Open Source Software 4.10 Explain procedural Languages and Nonprocedural Languages					
	General Objective 5.0: Understand security and safety procedures within a computer environment					
5 -6	5.1 Explain computer security. 5.2 Explain the need for computer room safety and security. 5.3 Explain methods of preventing hazards fire, flooding, sabotage etc 5.4 Explain malware infections and prevention e.g. virus and worms, Trojan horses, and spyware. 5.5 Explain standard procedure for installing anti-virus. 5.6 Explain data control techniques. 5.7 Explain computer system auditing 5.8 Explain the user passwords and username 5.9 Explain system	• Describe Computer Security and the need for computer room safety and security • Explain methods of preventing hazards fire, flooding sabotage etc. • Describe Malware infections and prevention • Explain system security using user passwords and username • Explain Computer Ergonomics	White Board. Charts, PC loaded with Presentation software package and connected to multimedia Projector	• Identify devices for computer room security • Identify actions that could lead to fire hazards, sabotage, viral and worm infections etc. • Set up computer system following ergonomics	Guide students on how to secure computer room and computer systems Guide students to formulate simple password that they could easily remember Guide students to set up systems to meet ergonomics standard	What are the actions to take in case of fire or sabotage? List some hard to guess passwords

	vulnerabilities, attacks, and how to mitigate against them 5.10 Explain computer ergonomics			standard		
	General Objective 6: Understand the concept of a computer network					
7-8	6.1 Explain Computer Network and its importance. 6.2 Describe different types of network topologies such as star, ring and bus. 6.3 Describe different types of network: LAN, MAN and WAN 6.4 Describe various LAN components.	• Define computer network. • Explain different types of network topology such as star, ring, bus etc. • Describe different types of networks: LAN, MAN and WAN • Describe various LAN Components	White Board. Charts, Networked PCs loaded with Presentation software package and connected to multimedia Projector	• Identify various computer • topologies • Point out organizations using the different topologies • Identify various types of computer • Networks. • Identify organizations using specific types of networks • Identify various LAN components	Guide students to identify various network topologies Guide the students to identify LAN components, network types and organizations using them.	Describe the different network topologies, their advantages and disadvantages? Describe situations whereby LAN, MAN and WAN are preferable.
	General Objective 7.0: Understand the principles and uses of the internet technologies					
9-11	7.1 Define Internet and explain its resources 7.2 Explain the processes	• Explain Internet and its resources	White Board. PC loaded with Presentation	• Browse and search the	Guide students to browse and search the	Demonstrate how to browse and search the Internet for

	involved in browsing, searching the internet for information. 7.3 Explain the concepts of Electronic Mail (e-mail), World Wide Web (www), Uniform Resource Locator (URL) etc. 7.4 Explain the concept of e-mail and acquiring email address 7.5 Explain the process of sending and receiving an e-mail. 7.6 Explain Internet Service Provider (ISP) and their functions 7.7 Explain Internet of Things (IoT), etc.	• Explain browsing and searching the internet for information • Explain the concept of e-mail, sending and receiving an e-mail. • Explain Internet Service Provider (ISP) and their functions • Describe Internet of Things (IoT) etc.	software package and internet browser	Internet for informati on • Compose and send e-mail. • Make use of any facility, connected to cloud, IoT etc.	Internet for information Guide students to compose and send E-mail. Guide students to use Cloud and IoT services	information Demonstrate how to compose and send E-mail. Demonstrate how to use Cloud and IoT services
	General Objective 8.0: Understand mobile & wireless and pervasive computing					
12-13	**8.1** Explain mobile computing and its applications. **8.2** Define the common terminologies of mobile computing. **8.3** Describe Wireless LAN, Wi-Fi, and voice portal **8.4** Explain the fundamentals of wireless communications. **8.5** Describe Bluetooth or	• Explain the emerging technologies to students on mobile, wireless and pervasive computing to the students. • Give assignments to students on distributed computing, mo	White Board. Charts, PC loaded with Presentation software package and connected to multimedia Projector			

	personal area networks. **8.6** Explain Global System for Mobile Communication (GSM) and next generations of mobile phone network. **8.7** Define the term "pervasive/ubiquitous computing" **8.8** State the applications of pervasive computing: - Smart Homes - Smart Appliances - Smart Cars - Smart Things **8.9** Explain mapping technologies and tracking tools in the digital age.	bile computing, location computing, mobile networking, sensor networks, human–computer interaction, context-aware smart home technologies, and artificial intelligence.				
	General Objective 9.0: Know IT Ethics and impacts of IT on the society					
14-15	9.1 Describe ethical Issues in IT. 9.2 Explain cyber-privacy and security. 9.3 Explain how to protect intellectual property 9.4 Identify impact of IT adoption on individuals, organizations and jobs. 9.5 State the impacts of IT on Health and Safety and Environment 9.6 Enumerate the importance of green computing or IT.	• Describe with case studies the advantages and disadvantages of IT ethnics of professionals and organisations. • Expatiate on benefits of green IT or computing • Itemise the	White Board. Charts, PC loaded with Presentation software package and connected to multimedia Projector			

	9.7 Describe Quality-of-Life Improvements through IT. 9.8 Explain online networking tools, their potential and their limitations 9.9 Describe digital economy and its associated business opportunities. 9.10 Explain the following terms: - Virtual Communities - Virtual Work and Telecommuting - Virtual learning - Virtual Reality 9.11 Explain virtualization and cloud computing. 9.12 Explain types, services and applications of cloud computing.	business opportunities in digital economy • Describe digital literacy, internet penetration, digital economy, cybercrime and online communities in Nigeria. • Describe international computer certification courses available to ICT students				

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feedback.	20
Practical	At least 5 home works to be assessed by the teacher	20
Total		100

Programme: National Diploma in Computer Engineering Technology	Course Code: CTE 112	Contact Hours: 45
Course: ELECTRICAL WORKSHOP PRACTICE AND TECHNOLOGY	Semester: 1	Theoretical: 1 hour /week
Year: 1	Pre-requisite:	Practical: 2 hours /week
Goal: This course is designed to enable students acquire the knowledge and skill in Electrical Installation practice		
General Objectives: On completion of this course the student, should be able to: 1. Understand the applications of wiring and safety regulations. 2. Know the use of electrical and electronic engineering tools and equipment. 3. Understand the construction and uses of different types of electrical cables and the regulations relating to their uses. 4. Understand various electrical wiring systems of equipment and accessories and the regulation relating to them. 5. Understand the testing and inspection of electrical installations.		

	Theoretical Content			Practical Content		
General Objective 1: Understand the applications of wiring and safety regulations						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-3	1.1 State the causes of hazards in electrical and electronic engineering. 1.2 Explain methods of preventing hazards. 1.3 List several important considerations and rules concerning health, safety and environment (HSE) at workplaces in Nigeria. 1.4 Define earth continuity conductor, earth electrode consumer's earth terminal. 1.5 Explain the necessity for earthing and relevant regulation concerning earthing. 1.6 Explain the protection of an installation by fuse and by earth leakage circuit breaker (ELCB). 1.7 Distinguish between solid earthing practice and earth leakage circuit breaker protection. 1.8 State a number of problems associated with earth leakage circuit breakers. 1.9 Describe how the human	• Explain causes of hazards such as lack of training, inadequate information, unsafe system of work, inadequate isolation of circuits, unsuitable test equipment, etc. • Ask students to Identify causes of electrical hazards in different places • Explain the use of safety devices, etc. • Explain the types and causes of burns and wounds	• Online resources, textbooks, IEE wiring regulations, Whiteboards, Multimedia projector & screen • Fist Aid box • Fire extinguishers	• Demonstrate (Artificial respiration) as listed in 1.12 • Administer first aid applicable to 1.13. • Use different types of fire extinguisher.	• Illustrate first aid applicable to 1.14. • Guide students to perform first aid applicable to 1.14. • Demonstrate and guide students in the use of different types of fire extinguisher	• List several important considerations and rules concerning health, safety and environment (HSE) at workplaces in Nigeria

	body can become part of an electric circuit. 1.10 Explain how to prevent electric shock. 1.11 Explain the methods of treating electric shock 1.12 Describe artificial respiration techniques 1.13 Identify common causes of burns and wounds. 1.14 List different types of fire extinguisher. 1.15 Explain when each in 1.14 is applicable.					
General objective 2: Know the use of electrical and electronic engineering tools and equipment						
4-5	2.1 List the tools obtainable inside an electrician's toolbox. 2.2 Explain the use of electrical and electronic workshop tools 2.3 Describe procedure for carrying out routine inspection of hand tools. 2.4 Distinguish between a hand tool and a machine tool.	• Show the students the various electrical and electronic tools • Explain the between a hand tool and a machine tool.	• Online resources, textbooks, IEE regulations, Whiteboards, Multimedia projector & screen	• Identify different types of electrical and electronic tools • Use common workshops tools and equipment.	• Demonstrate the use of different types of electrical and electronic tools • Assign students into groups • Provide practical manuals to students • Ensure that the workshop is safe for use • Ensure that all tools and	Explain the use of Electrical and Electronic Toolboxes List and explain different hand and machine tools

					materials to be used have been provided	
	GENERAL OBJECTIVE 3: Understand the construction and uses of different types of cables and the regulations relating to their uses.					
6-7	3.1 List the types of insulating and conducting materials. 3.2 Distinguish between conductors and insulators. 3.3 Describe, with the aid of sketches, the construction of different types of cables. 3.4 State the advantages and disadvantages when using: i. P.V.C- insulated, P.V.C -sheathed cables. ii. Mineral-Insulated metal-sheathed cables. iii. Armoured P.V.C-Insulated, PVC sheathed cables. iv. Steel and PVC conducts. v. Steel and PVC trunking. vi. Flexible cable and cord etc. 3.5 Explain the general IEE wiring regulations related to cables and their uses.	• Describe, with the aid of sketches, different types of cables. • Explain IEE regulations in relation to cables • Describe the various colour codes use for cable used in Nigeria • Use current IEE wiring regulations to teach the students • Give assignments to students on cable classification and their uses	• Online resources, textbooks, IEE wiring regulations, Whiteboard, Multimedia projector & screen • Various sizes of cable, Cable sample Board, Electrical/Electronic toolboxes	• Identify different types of cables • Perform various types of joints using PVC and other cables	• Show the student different types of cables • Ask the students to identify different types of cables • Show the student cables with different colour • Ask the students to identify different colours for live neutral and earth. • Offer support to groups of students • Assess the students performance	Distinguish between conductors and insulators List out the advantage of the following: State the advantages and disadvantages when using: vii. P.V.C-insulated, P.V.C -sheathed cables. viii. Mineral-Insulated metal-sheathed cables. ix. Armoured P.V.C-Insulated, PVC sheathed cables. x. Steel and PVC conducts.

	3.6 Identify the cable colour coding, commonly used in Nigeria.				during the practical classes and their reports	
	GENERAL OBJECTIVE 4: Understand various electrical wiring systems of equipment and accessories and the regulation relating to them.					
8-13	4.1 Identify different wiring methods such as conduits, ducts, trunking and surface etc 4.2 List factors associated with the choice of a particular wiring system. 4.3 State the uses of pattresses and blocks for electrical wiring. 4.4 Illustrate Installation of electrical accessories such as plugs, adaptor, ceiling roses, sockets switches etc using wiring methods. 4.5 Describe 2-way switches with two intermediate switches to control various lighting points, 4.6 Explain wiring of electric bell-indicator and alarm circuits, ELCB, domestic ring main circuit, consumer control units. 4.7 Describe the distribution of power in a consumer premises employing single phase, four wire systems. 4.8 State the regulation relating to 4.5 to 4.7 above	• Explain wiring methods • Describe factors considered in the choice of wiring systems • Ask to identify and draw electrical accessories such as plugs, adaptor, ceiling roses, sockets switches • Sketch 2-way switches with two intermediate switches to control various lighting points, • Sketch wiring of	• Online resources, textbooks, IEE wiring regulations, Whiteboard, Multimedia projector & screen • Conduits, ducts, trunking , Electrical accessories and consumables, wiring boards, Wooden simulation walls, Electrical/Electronic toolboxes, circuits, ELCB, • cooker control unit,	• Install electrical accessories such as plugs, adaptor, ceiling roses, sockets switches etc. using different wiring methods • Wire 2-way switches with two intermediate switches to control various lighting points • Wire electrical bell, bell-	• Assign students into groups • Provide practical manuals to students • Ensure that the workshop is safe for use • Ensure that all tools and materials to be used have been provided.	Illustrate Installation of electrical accessories such as plugs, adaptor, ceiling roses, sockets switches etc using wiring methods

	4.9 Describe the steps for preparing requisition for wiring materials. 4.10 Explain the modular wiring systems and accessories.	electric bell-indicator and alarm circuits, ELCB, domestic ring main circuit, consumer control units • Explain single phase, four wire systems and three phase supply for residential buildings • Describe various software packages to draw and simulate and electrical wiring system. • Describe the modular wiring system		indicator and alarm circuits, ELCB, domestic ring main circuit cooker control unit, consumer control unit and discharge lamps. • Distribute power in a consumer premises employing single phase four wire systems, Prepare requisition for wiring materials.		
	GENERAL OBJECTIVE 5: Understand the testing and inspection of electrical installations					
14-15	5.1 State basic requirements for testing and inspection of electrical installation. 5.2 Draw the electrical	• Mention requirements for testing and inspection of	• Online resources, textbooks, IEE wiring regulations, Whiteboard,	• Demonstrate the test listed in 5.4. • Guide the	• Offer support to groups of students	Megger, Multimeter, earth loop tester Explain the following test:

	diagrams of testing procedures. 5.3 List various instruments for carrying out testing and inspection work. 5.4 Explain the following test: i. Polarity; ii. Continuity test; iii. Insulation resistance test; iv. Test of ring circuit continuity; v. Test of effectiveness of earthing	electrical installation. • Sketch the electrical diagrams of testing procedures. • Describe the following test as listed in 5.4 • Describe various software packages to draw and simulate and electrical wiring system	Multimedia projector & screen • Megger, Multimeter, earth loop tester	students to carry out the test in 5.4	• Assess the students performance during the practical classes and their reports. • Provide practical manuals to students • Ensure that the workshop is safe for use • Ensure that all tools and materials to be used have been provided	i. Polarity; ii. Continuity test; iii. Insulation resistance test; iv Test of ring circuit continuity; v Test of effectiveness of earthing

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and skills	40
Test	At least 1 progress test for feedback.	20
Practical / Projects	To be assessed by the teacher	40
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 113	CREDIT HRS: 45 HRS
COURSE: COMPUTER APPLICATION PACKAGES	COURSES UNIT 3.0	
Goal: The course is designed to provide students with the knowledge of the concepts of computer application packages.		
GENERAL OBJECTIVES: On completion of this course the student should be able to: 1.0 Know the existing application packages 2.0 Understand word processing packages 3.0 Use spread sheets packages 4.0 Know Data Base Management System (DBMS) 5.0 Know the existing statistical packages 6.0 Understand graphics packages 7.0 Use presentation packages 8.0 Understand the concepts in Computer Aided Design.		

Theoretical Content						
	GENERAL OBJECTIVE 1: Know the existing application packages					
Week	**Specific Learning Outcomes**	**Teacher's Activities**	**Learning Resources**	**Specific Learning Outcomes**	**Teachers Activities**	**Evaluation**
1	1.1 Define application software. 1.2 Differentiate between systems software, application packages, program generators and Apps. 1.3 Identify the modes of packages acquisition. 1.4 State the criteria for software package acceptability. 1.5 List various types of packages.	State the levels of computer software i. System software ii. Application software Define application software. Describe the development of application packages State various types of application software and the tasks for which they are suited Explain the use of web apps, App store, App Installation, recovery and deletion	Marker, White board, Recommended textbooks, Lecture Notes. PC (with relevant application packages installed), Multimedia Projector Projector Screen Internet connection	Install software Applications, Web Applications and Apps downloaded from App Store or other reliable sources	Demonstrate how to Install and work with Softwares and Web Application List the sources of software package acquisition Enumerate the criteria for software package acceptability Guide students on how to Install and work with Packages Guide the student on how to install and work with an App downloaded from App Store	Differentiate between Desktop Softwares and Web Applications How are application packages developed? Explain the various types of application software and the tasks for which they are suited List the criteria for application package acceptability. List some application packages and their uses
	GENERAL OBJECTIVE 2: Understand Word Processing Packages					

2 – 3	2.1 Define a word processor 2.2 State the use of word processor. 2.3 Explain the main menu 2.4 Carry out text input and editing using word processor. 2.5 Use block-editing commands. 2.6 Use document and non-document text processing. 2.7 Identify functions of professional word processors e.g. desktop publishing.	Define a word processor and explain the features of a word processor package Describe the process of starting and exiting word and some common screen elements Explain how to carryout basic operations in word Describe how to create tables, import and crop graphics/images in word Explain how to manipulate text using common features, use the ruler to create, modify or delete tab settings Explain how to carryout Design, Layout, Mailings and Review operations in word	Marker, White board, Recommended textbooks, Lecture Notes. PC (with relevant application packages installed), Multimedia Projector Projector Screen	Create a word document and Carryout basic operations in Microsoft word Create tables and insert objects/images and graphics in word Perform document formatting in word	Guide students to perform some basic operations in word i. create and save files **ii.** carry out basic formatting operations Demonstrate how to create tables, insert objects and graphics, change margins, paper size, or the orientation, remove page breaks, mail merge	Explain how to start and exit Microsoft Word Identify some common screen elements Explain how to create tables, import and crop Explain processing activities such as: formatting, Text manipulation and page setting
	GENERAL OBJECTIVE 3: Use spreadsheets packages					

4 – 5	3.1 Define a spreadsheet package and give examples 3.2 Name the types of spread sheets. 3.3 Explain the use of spread sheet in forecasting. 3.4 Use Lotus 1-2-3, Multiplan, Excel, Google sheets or any available spread sheet. 3.5 Solve statistical analysis problem using a spreadsheet package. 3.6 Explain how to perform specific accounting functions using spread sheet. 3.7 Highlight data security requirements on spread sheet data. 3.8 Explain the use of spread sheet in a forecasting project, financial analysis, production scheduling and control and other forms of modeling	Define a spreadsheet package and give examples Explain the Microsoft Excel package Explain basic terminologies and concepts for spreadsheets such as Cell, Column, Row Range, Worksheet, Workbook etc Use the spreadsheet to create tables, graphs and charts Describe the use of spreadsheet for statistical and accounting functions; and highlight data security requirements on spread sheet data.	Marker, White board, Recommended textbooks, Lecture Notes. PC (with relevant application packages installed), Multimedia Projector Projector Screen	Create a spread sheet document Open a spread sheet document Carryout some key spreadsheet operations Carryout some key spreadsheet operations using cell references	Guide students to open, save and close workbooks Guide students to carry out the following activities in Excel: select cells for a variety of purposes; copy and move data; change the column width or row height; create simple formulas and use common built-in functions. Merge and unmerge cells, cut, copy, and paste data Guide students to use accounting functions in a workbook Guide students to carryout forecasting and analysis in excel	Explain how to use spreadsheet to carry out general statistical functions using cell references in a spreadsheet Explain how to sort or filter information in a worksheet Explain how to work with tables Explain the following: forecasting project, financial analysis, production scheduling and control and other forms of modeling. How do you create a forecast in Excel?
	GENERAL OBJECTIVE 4: Know Data Base Management System (DBMS)					
	4.1 Define DBMS 4.2 Identify the types of DBMS	Explain the tools and menus in a DBMS	Marker, White board, Recommended	Apply a DBMS to Create, Save,	Demonstrate how to Create, Save	What is a DBMS?

6 –7	4.3 State the use of DBMS 4.4 Explain the functions of a Database Management System (DBMS) e.g. Microsoft Access, MySQL, SQL, etc. 4.5 Explain the building blocks of a Database. 4.6 Explain basic database operations. 4.7 Use D-base packages 4.8 Write simple program using D-base. 4.9 Identify other Data Base Management packages.	Define Fields, Records, Tables, Forms and Views Explain different Data Types: Numeric, String, Boolean, Date, etc. Give examples of DBMS operations (update, sorting, etc.) Explain Queries, update, sorting, etc.	textbooks, Lecture Notes. PC (with relevant application packages installed), Multimedia Projector Projector Screen Relational DBMS	and Retrieve Personnel information Find and sort data using the records above: Create queries and forms Create personnel report using the records above. Print personnel report.	and Retrieve information from a database. Illustrate how to carry out the following database operations: Find and Sort Data Work with Queries and Forms Demonstrate how to create Reports and Print Reports	Describe the building blocks of a database. List DBMS packages and uses Write simple program using D-base
	GENERAL OBJECTIVE 5: Know the existing statistical packages					
8 – 9	5.1 Describe statistical packages. 5.2 State various type of statistical packages available. 5.3 Describe File management in SPSS 5.4 Explain data file Storage and Retrieval. 5.5 Apply Excel and SSPS to solve practical problems.	Define statistical package. Identify some common statistical packages and their uses. Explain the main features of SPSS Explain the general aspect, workflow and critical issues Explain Functions, Menus and	Marker, White board, Recommended textbooks, Lecture Notes. PC (with statistical package installed), Multimedia Projector Projector Screen Internet connection	Demonstrate the concept of Variable Use computer system to generate data Explain Data Tranformation	Demonstrate the concept of Variable Illustrate how to generate data online Illustrate how to Transform Data Demonstrate how to create different statistical tables and charts	What is SPSS? Identify the general features of SPSS Explain Sorting and Transpose in SPSS. Explain how to store and retrieve files Describe variable Explain the various methods of data Input Explain Data

		commands Explain file management in SPSS Explain data file Storage and Retrieval Define Variable and Explain variable view spreadsheet Explain Manual Data Entry Describe how to generate data and Import file using computer system Explain Data Transformation Explain Syntax files and scripts Explain output Management				Transformation Enumerate the various types of statistical tables Explain how to construct frequency tables and graphs Enumerate the merits and demerits of charts and diagrams
	GENERAL OBJECTIVE 6: Understand graphics packages					
	6.1 Explain the features and functions of graphics	Define Graphic images	PC	Demonstrate basic	Identify different graphic	What are the most commonly used graphics

10 – 11	packages. 6.2 List the uses of graphics packages. 6.3 Explain different types of graphic representations e.g. pictures, drawings, charts, animations, etc. 6.4 Explain the interface and design space of Graphic Packages. 6.5 Explain various tools and their functions in graphic application packages. 6.6 Explain how to create a simple graphic design. 6.7 Solve problems using available package	Explain types of digital image files: TIFF, JPEG, GIF, PNG, etc. Explain features of: Greeting cards, flyers, posters, Newsletters, Brochures Explain the Menus and Toolbox of a graphic design application Explain the process of creating and saving a design document. Explain how to manipulate Fonts and Images Explain how to use colors	Multimedia projector Graphic application packages	understanding of graphic applications. Identify different tools in the toolbox. Design a business card that has text and a logo. Apply color to an object and create an outline	Application Packages. Explore the toolbox and other features of the interface. Demonstrate how to create and save documents, use fonts, resizing, rotating and moving documents. Guide students to design a business card	packages and what are their functions? What is the process of creating and saving a design document? What are the basic tools needed to manipulate text and graphic? List and image file formats
	GENERAL OBJECTIVE 7: Use presentation packages					
12 – 13	7.1 Describe Presentation Package. 7.2 Explain how to use a Presentation Package to prepare presentations. 7.3 Explain how to insert and	Explain the concept of power point presentation. Explain how to create a	PC with Office Software and Apps connected to the internet	Create a PowerPoint presentation Apply transitions to	Demonstrate how to connect to external/extended monitors to display presentation (Cables, Audio)	Explain how to apply transitions to slides, share presentations and publish slides

	animate multimedia objects on slides. 7.4 Explain how to apply transitions to slides, share presentations and publish slides. 7.5 Explain file types compatible with presentation.	presentation and use basic formatting features on a slide. Explain how to manipulate text or objects on slides. Explain how to implement animated slide show of specific time duration	Multimedia Projector Projector Screen PC with Office Software and Apps connected to the internet Multimedia Projector Projector Screen	slides, share presentations and publish slides Demonstrate file types compatible with presentation Demonstrate the design slides (show how to use templates)	Demonstrate how to use presentation views and modes Demonstrate how to add animations, effects, and slide transitions Demonstrate how to create and organize slides (Slide management, Inserting and managing media files) Demonstrate presentation software options (Presentations, Add slides, Delete slides, revise slide order, Layout)	Prepare presentation slides in the following views Normal view Slide sorter view Notes page view Outline view Slide show view Presenter view Master views: Slide, handout and notes
	GENERAL OBJECTIVE 8: Understand the concepts in Computer Aided Designs					
14 – 15	8.1 Explain the concept of Computer Aided Design (CAD). 8.2. Explain the interface and design space of CAD. applications (like AutoCAD, CAD, SmartDraw, etc.). 8.3 Explain layout planning and plotting. 8.4 Understand how to create 3D images.	Explain the basics of CAD applications (like AutoCAD, CAD, SmartDraw, etc.) Explain drawing with precision using CAD Applications.	PC Multimedia Projector CAD Applications (like AutoCAD,	Create a basic design using a CAD applications Set Running Object Snaps Apply Object Snap Overrides	Guide students to create a design using a CAD application Illustrate how to set Running Object Snaps	Explain the concept of Computer Aided Design Explain the functions of basic design tools in a CAD application. Explain Blocks and Attributes. What are their relevance in design?

	8.5 Explain Blocks and Attributes 8.6 Explain layers. 8.7 Explain Layouts. 8.8 Explain how to setup a Layout.	. Explain controlling the drawing display. Define Blocks and explain their functions Outline the steps involved in creating attribute definitions. Explain Layer and its significance in CAD Explain Layouts and their significance to design.	CAD, SmartDraw, etc.)	Use Polar Tracking to display alignment paths Use Object Snap Tracking Create a Block Use dynamic blocks in a drawing. Use Blocks with Design Center Use Blocks with Content Explorer Use attributes to add text to a Block. Create Layer with a Layer standard Plan a layout and carryout plotting. Create three-dimensional images Create layering, projection types and solid	Illustrate how to override Object Snaps Demonstrate how to use Polar Tracking Demonstrate how to use Object Snap Tracking Demonstrate the steps involved in creating Blocks. Illustrate the steps in creating, editing, and deleting attributes. Illustrate the steps for inserting Blocks. Illustrate how to Work with Dynamic Blocks Guide students to create Layers with Layer Standard Demonstrate how to plan a layout and carryout plotting. Illustrate how to Create three-	What is a layout? Explain the steps to setup a layout

				modeling	dimensional images Demonstrate how to create layering, projection types and solid modelling	

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

Programme: National Diploma in Computer Engineering Technology	Course Code: CTE 114	Contact Hours: 45
Course: INTERNET AND WEB TECHNOLOGIES	Semester: 1	Theoretical: 1 hours /week
Year: 1	Pre-requisite:	Practical: 2 hours /week
Goal: This course is designed to enable students to acquire basic knowledge of Internet and Web Technologies		
General Objectives: On completion of this course the students should be able to: 1. Know the meaning and historical background of Internet 2. Understand how to Navigate the Internet and Common Website Functionalities 3. Understand Social Media and Various Internet Communication Methods 4. Understand Online Conferencing and Streaming 5. Understand Digital Principles, Ethics, Skills and Citizenship 6. Understand creation and customizing in HTML 7. Understand Dynamic Hypertext mark-up language (DHTML). 8. Understand the operation and usage of XML and graphic packages		

Theoretical Content				Practical Content		
General Objective 1: Know the meaning and historical background of Internet						
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Evaluation**
1	1.1 Define Internet. 1.2 Narrate the history of Internet. 1.3 Explain Intranet and Ethernet. 1.4 Distinguish between internet and intranet	• Explain Internet concept • Explain historical background of the Internet. • Explain Intranet and Extranet • Distinguish between Internet, Intranet and Ethernet.	White Board/marker pen, Computer Lab with Internet Connectivity, multimedia Projector, Projector Screen	Browse the internet for information	Assist students to browse for information on the internet	What is internet? How did internet come about? What are the difference s among Intranet, Extranet and Internet?
	General Objective 2: Understand how to Navigate the Internet and Common website functionalities					
2-3	2.1 Describe how the Internet works and how devices communicate. 2.2 Define and describe Domain Name System DNS and explain how to name servers in the DNS. 2.3 Define IP addressing (IPv4 and IPv6) and explain	• Explain TCP/IP and Network Topology • Briefly explain the OSI reference model • Explain the Components of World Wide Web (www) • Explain the differences between Internet and intranet (closed network and open network), DNS, IP addresses (IPV4 and IPV6), subnetting, how	White Board /marker pen Computer Lab with Internet Connectivity Multimedia Projector Projector Screen Network Simulation Application Packages (eg GNS3)	Connect a system to the internet Demonstrate how devices communicate on a network Identify various domain types Search the Internet using keywords and hashtags Access valid and	• Guide the students on how to connect to the internet and show hot works. • Guide students on how to name • servers in • Domain Name • System • Show various domain types • Guide students on how to search and apply	Differentiate between public and private networks Describe packets and how they make their way across the internet

	subnetting; 2.4 Define Bandwidth, explain its characteristics and how it is managed. 2.5 Describe how to search the internet and explain browser resources 2.6 Gain an understanding of research fluency and validity of resources from the internet. 2.7 Explain Intellectual Property and its rights usage, licensing rules/laws regarding Intellectual Property and Software Programs; and creative common licence. 2.8 Explain copyrights, plagiarism, its	devices communicate on a network • Explain the various domain types [.gov, .edu, .com, .us, .uk, etc.] • Explain Bandwidth and its characteristics and management. • Explain browser resources and their functions: (HTML/CSS, Cookies, Cache, Breadcrumbs, Plugins, Widget, Add-ons, In-browser apps, Popups, Browser navigation (URLs, scroll bars, etc.), New window, tabs, bookmarks, favorites, synchronize bookmark • Explain Intellectual Property rights regarding images and articles, which have owners; • Explain creative common licence and analyse licensing rules/laws with regards Intellectual Property and Software Program		invalid sites Search for resources on the internet using search engines and browser Use common website navigation conventions such as click, double-click, mouse over, drag and drop Apply basic web navigation principles	advance searches using keywords and hashtags • Show students valid and invalid sites to observe their features • Show the following browser resources : Cookies, Cache, Breadcrumbs, Plug ins, Widget, Add-ons, In-browser apps, Popup, Browser navigation(URLs, scroll bars, etc.), New window, tabs, bookmarks, favorites, synchronize bookmark in a browser • Demonstrate how to validate online resources. • Guide students on how to detect copyrighted content and how to sensor	

	rules/laws and the implication of their violation. 2.9 Explain a URL and identify its parts. 2.10 Describe how to use common website navigation conventions such as click, double-click, mouse over, drag and drop. 2.11 Describe the basic web navigation principles.	• Explain plagiarism, its laws and punishments as well as how to detect plagiarism and fair use of internet • Explain copyrights with respect to internet usage and censorship and why censorship is needed; • Explain appropriate use of the Internet in a business setting so as not to offend others or search for offensive material; • Explain the legality and appropriateness of companies blocking sites such as youtube, facebook or other sites;			contents on the internet. • Guide students on how to detect plagiarism using anti plagiarism software	
General Objective 3: Understand Social Media and Various Internet Communication Methods						
4-5	3.1 Explain how to use web-based email application eg mail, yahoo. 3.2 Define Digital Identity and explain the concept of digital identity (identity on social media). 3.3 Explain social	• Explain the concept of digital identity (identity on social media) • Explain social networks and how they are used (Facebook, LinkedIn etc.); • Define social network; Describe how Facebook is a social network; • Describe LinkedIn and how it functions as a	White Board /marker pen, Computer Lab with Internet Connectivity, Multimedia Projector, Projector Screen	Create a Facebook and LinkedIn account Create a YouTube and Instagram page; Open media sites (eg Neo and Yammer and Slack) Open social media site and a closed site;	• Guide student on how to create a social media account using Facebook, LinkedIn, etc • Demonstrate how to use Neo and Yammer	Define Digital Identity Explain Social Networks and give examples Identify the social media application that can be used to create a professional

	networks and how they are used (Facebook, LinkedIn etc.); 3.4 Describe LinkedIn and how it functions as a social network and how it is a valuable social network for business. 3.5 Explain other types of networks (YouTube, Instagram, etc.). 3.6 Describe followership and its influence on social networks such as YouTube, twitter, Facebook, Instagram etc; 3.7 Differentiate between internal (school/business) and open media sites (eg Neo and Yammer and Slack) 3.8 Explain Blogs, Wikis and Forums and how they are used.	social network; • Explain how LinkedIn is a valuable social network for business • Explain the other types of networks (YouTube, Instagram, etc.); • Describe followership and its influence on social networks such as YouTube, twitter, Facebook, Instagram etc; • Describe how you are choosing your digital identity based on the networks choices you make on all of these networks; • Differentiate between internal (school/business) and open media sites (eg Neo and Yammer and Slack) • Differentiate between an open social media site and a closed site; Neo vs Facebook (What makes it different from Facebook) • Explain Blogs, Wikis and Forums and how they are used. • Define cyber bullying. • Explain inappropriate		Use blogs, Wikis and Forums and used them.		identity for employment opportunities.

	3.9 Explain cyber bullying and inappropriate behaviors on the internet.	behaviors on the internet				
General Objective 4: Understand Online Conferencing and Streaming						
6-7	4.1 Describe internet communication technologies. Eg emails, sms, Instant Message (IM), Voice Over IP (VOIP), internet phone calls, web ex, web-conferencing etc. 4.2 Explain the advantages of the various internet communication technologies. 4.3 Explain the use of chat platforms and its advantages in teaching and learning. 4.4 Explain the concept of e-learning (distant learning technologies) and its advantages. 4.5 List some distant learning technologies. 4.6 Describe and identify various platforms for web and video conferencing. 4.9 Explain how to use the following online conferencing offerings:	• Explain the various communication technologies on the internet. (emails, sms, Instant Message (IM), Voice Over IP (VOIP), internet phone calls, web ex, web-conferencing etc) • Explain the different circumstances that will require each of the various communication technology and their advantages. • Explain the use of chat platforms and its advantages in teaching and learning • Explain the concept of e-learning (distant learning technologies) with examples and its advantages. • Describe and identify various platforms for web and video conferencing. • Describe the common	White Board /marker pen Computer Lab with Internet Connectivity, Multimedia Projector, Projector Screen	Use various communication technologies on the internet. (emails, sms, Instant Message (IM), Voice Over IP (VOIP), internet phone calls, web ex, web-conferencing etc) Use chat platforms. Use e-learning Identify various platforms for web and video conferencing. Edit a document collaboratively. Carry out a video and VOIP online conference using Google hangouts, Skype, Face Time,	• Guide students on how to create emails. • Guide students on how to use various internet technologies. • Demonstrate the use of chat platforms. • Demonstrate the use of Skype as platform for learning and business. • Describe how to use a distant learning technology eg MOODLE • Demonstrate how to use the following online conferencing offerings: VOIP, Video Conferencing	Describe email and texting Describe how to select the best communications tool for a given situation Describe the benefits and function of online conferencing tools Describe benefits and function of business collaboration tools Describe distance learning technologies

	VOIP, Video Conferencing (Google hangouts, Skype, Face Time) 4.11 Explain streaming and how it works. 4.12 Differentiate between streaming and downloading. 4.13 Define live audio. 4.14 Explain how to stream the video of a live recording.	feature of such platforms eg screen sharing etc. • Describe collaborative document editing.		Zoom , MS Team etc Carry out a phone conferencing and Screen sharing Carry out a video streaming and Download and present a live audio. Carry out a video streaming of a live recording.	(eg. Google hangouts, Skype, Face Time) • Demonstrate how to use phone conferencing and Screen sharing • Demonstrate how to stream • Demonstrate how to download • Demonstrate how to stream live video recording. • Demonstrate how to stream live audio recording	
General Objective 5: Understand Digital Principles, Ethics, Skills and Citizenship						
8-9	5.1 Explain the importance of ethical behavior in online presence. 5.2 Explain Digital Wellness basics as it affects screen time and ergonomic best practice. 5.3 Explain online identity management, branding, Digital footprint.	• Explain the online and offline communities and the ethical behavior applicable to both • Explain the importance of demonstrating sensitivity when determining most appropriate technology to use	White Board /marker pen Computer Lab with Internet Connectivity, Multimedia Projector, Projector Screen	Create a social media account	• Show students an online community for a comparative analysis with a real life community • Guide students on how to create a social media account	Differentiate between Online and Offline Communities Define Digital Wellness Explain Online Identity Management

	5.4 Explain how to create an online identity and its importance to prospective employers.	when communicating with others. • Explain Online Identity Management and how to create an online identity and its importance to prospective employers. • Explain the differences between personal and professional online identity • Explain Branding and Digital footprint. • Explain how to manage profiles on social media eg Facebook, Twitter, LinkedIn				
	General Objective 6: Understand creation and customizing in HTML					
10-12	6.1 Explain how a web page works. 6.2 Explain how mark-up languages work. 6.3 Explain how hypertext works. 6.4 Explain how URL works. 6.5 State functions of HTML. Text formatting, hyperlinks, tables and lists, graphics, sound and video support.	• Describe the functions of HTML. Explain planning of an HTML document. Describe writing of an HTML document. • Preview and editing of a web page. • Show how to create links to other web pages. • Demonstrate printing of an HTML	White Board /marker pen Computer Lab with Internet Connectivity, Multimedia Projector	Design a web page Plan and write a HTML document. Preview and edit a web page. Create links to other web pages. Print an HTML document. Create ordered list in HTML document. Create unordered	Guide students during the practical works	Networked PC Lab connected to the internet.. Web application packages such as Dream weaver, MS front page

	6.6 Plan and write a HTML document. 6.7 Preview and edit a web page. 6.8 Create links to other web pages. 6.9 Print an HTML document. 6.10 Explain how to Create ordered list in HTML document. 6.11 Describe how to create unordered list in HTML document. 6.12 Explain the following: i. Control font selection in HTML document. ii. Customize fonts in HTML document. iii. Align text in HTML document. iv. Insert graphics and specify graphic size. v. Link graphics in HTML document. vi. Insert on image map in HTML document. vii. Add background	document. • Explain creation of ordered/unordered list in HTML document. Customizing font and Controlling font selection Aligning text in HTML document.		list in HTML document. Control font selection in HTML document. Customize fonts in HTML document. Align text in HTML document. Insert graphics and specify graphic size. Link graphics in HTML document. Insert on image map in HTML document. Add background image in HTML document. Explore multimedia options. Use of forms to control input. Creating a text entry field. Adding radio buttons. Adding checkboxes Creating a pull down menu Adding a push button Connecting forms back end.		

	image in HTML document. 6.13 Explore multimedia options. 6.14 Illustrate the following: i. Using forms to control input. ii. Creating a text entry field. iii. Adding radio buttons. iv. Adding checkboxes v. Creating a pull down menu vi. Adding a push button vii. Connecting forms back end. viii. Working with tables; ix. create a simple table span rows. x. Format borders modify table backgrounds, change table dimensions; align table counters; portion page elements. xi. Control pay layout. xii. Create a navigational bar.			Work with tables; create a simple table span rows. Format borders modify table backgrounds, change table dimensions; align table counters; portion page elements. Control pay layout. Create a navigational bar. Create a tram rat Create target links Format frame boarders Create a structuring table Add a two toned background Create a template		

	xiii. Create a tram rat xiv. Create target links xv. Format frame boarders xvi. Create a structuring table xvii. Add a two toned background xviii. Create a template 6.15 Explain the advantages of using scripting with HTML (Flexibility, Simplification immediate response, improved interactivity, reduced server loads).					
	General Objective 7: Understand Dynamic Hypertext mark-up language (DHTML).					
13-14	7.1 Define dynamic HTML 7.2 Explain the building blocks of DHTML 7.3 Tour DHTML pages 7.4 Describes DHTML object model 7.5 Describe Browser variability 7.6 Design D HTML pages 8.7 Research into code architecture 7.8 Keep up with DHTML charges. 7.9 Explain dynamic	Explain the DHTML, its building blocks, object models design.	P.C connected to OHP Power point presentation of Lecture notes. On line lecture notes	Design and implement web page using DHTML.	Provide guidance and assistance in student practical work.	Networked PC Lab connected to the internet.. Web application packages such as Dream weaver, MS front page

	content by: - Inserting content dynamically - Deleting content dynamically - Modifying Content dynamically - Incorporating assent advanced content function. - Replacing graphics dynamically. - Bind data - Manipulate bound data dynamically.					
	General Objective 8: Understand the operation and usage of XML and graphic packages					
15	8.1 Explain the concept of XML. 8.2 Demonstrate how XML is used. 8.3 Explain the advantages of using XML. 8.4 Explain the operations of graphic packages such as: PhotoShop, Animation Packages, Dreamweaver, Flash to create web pages		P.C connected to OHP Power point presentation of Lecture notes. On line lecture notes	Use XML package and apply to a given case.	Provide guidance and assistance in student practical work.	Networked PC Lab connected to the internet.. XML and CSS packages

Type of Assessment	**Purpose and Nature of Assessment**	**Weighting (%)**
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	20

Practical / Projects	To be assessed by the teacher	40
Total		100

Course: DATA STRUCTURES	CODE: CTE 115	CONTACT HRS: 30 HRS
Year: One	**Pre-requisite:**	CREDIT UNIT: 2
GOAL: The course is designed to acquaint students with the application and use data structures and algorithms to develop efficient program and communicate of technical concepts and ideas**.**		
General Objectives: On completion of this course the student should be able to: 1. Understand concepts of data structure and tools. 2. Know tools for studying data structure: symbols, relations and graph. 3. Understand sets relations and string structure. 4. Know data life cycle representation, properties of ordered and occupancy. 5. Understand the properties of order and linear list. 6. Understand simple linked lists and algorithm complexity 7. Understand non-linear structures. 8. Understand different sorting and searching techniques		

Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
	General Objective 1: Understand concepts of data structure and tools.					
Week	**Specific Learning Outcomes**	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1	1.1 Define data structure. 1.2 Define data attributes; name, value range, data types. 1.3 Define unit for identifying data, character, fields, subfields, records, Files.	Describe concept of data structure Explain data attributes , name, value range and data types Explain concepts of character fields, sub field, records and files	White board and multimedia projector	Use data attributes, file, sub field, records and files	Demonstrate using relevant examples concepts of attributes, name, value range and data types character fields, sub fields, records and files	Explain data structure, name, value range, data types
	General Objective 2: Know tools for studying data structure: Symbols, relations and graph.					
2	2.1 Define symbols, relations and graph 2.2 Explain the symbols for expressing relations among data. 2.3 Position relation cell contents, record location, transfer key. 2.4 Order relation; record rank, cell rank. 2.5 State properties of graph: routes, edge, sequences, directed and non-	Explain the meaning of data structure. Describe symbols, relations and graph. Describe the symbols for expressing relations among data, position relation cell contents, record location and transfer key. Explain the properties of graph: routes,	White board and Multimedia projector	Use symbols, relations and graph	Demonstrate using relevant examples on how to use symbols, relations and graph	Explain the basic operation using symbols, relations and graph

	directed. 2.6 Describe operations such as precede, less than points to, move to, search, change, entry.	edge sequences, directed and non-directed Describe operations such as precede, less than points to move to , search, change, entry				
	General Objective 3: Know set relations and string structure					
2-4	3.1 Define sets and relation. 3.2 Define the elements of sets, subsets, super sets, universal set and null set. 3.3 Describe set operations.	Describe Sets and relations Concepts of subsets, super set, Universal set and null set.	White board and Multimedia projector	Write simple programs to carry out set operations	Demonstrate giving real life example. Guide the students on how to develop simple programs using any data structure	Design a simple program to implement set and relation data structure
	General Objective 4: Know data life cycle data representation, properties of ordered and Occupancy					
5 - 6	4.1 Explain the term occupancy leans, empty, loose. 4.2 Distinguish and define birth, death and change of data. 4.3 Define a sequential list. 4.4 Explain the differences between fixed and variable length fields. 4.5 Implement fixed	Explain Different life cycle of data Describe sequential list Record length outlining the fixed and variable length.	White board and Multimedia projector	Use variable fixed length record	Demonstrate concept of fixed and variable length using appropriate examples.	Explain the differences between fixed and variable length fields

	and variable fields.					
	General Objective 5: Know the properties of ordered and linear list					
7	5.1 Define ordered and linear list. 5.2 Explain operations that can be performed on an ordered list: append, search (including delete, sort, selection and exchange, merge, including multiway merge and balance merge).	Define ordered and linear list. Describe various operations that can be performed on ordered list.	White board and Multimedia projector	Carry out ordered list operations	Demonstrate using appropriate examples concept of ordered and linear lists. Demonstrate how to perform ordered list operations	
	General Objective 6: Know simple linked lists and algorithm complexity					
8-9	6.1 Describe different types of linked list array, double linked list, queues, stack, dequeues, trees. 6.2 Explain the use of pointers. 6.3 Describe storage mapping. 6.4 Describe time complexity issues. 6.5 Definition of big 'O'. 6.6 Analyse algorithms to	Define linked list and compare it with linear list. Explain types of linked list. Describe different types of trees. State the use of pointers	White board and Multimedia projector	Demonstrate the push and pop operation possibly with diagram. Carry out operations on linked lists e.g push and pop on stacks and all operations on over list	Describe various operations that can be performed on linked list	

	determine their running time and the order of their running time linked lists.						
	General Objective 7.0: Know non – linear structures.						
10-12	7.1 Describe tree and its structure. 7.2 Define a tree properties 7.3 State properties of tree. 7.4 Describe different types of binary tree. 7.5 Explain binary tree). representation. (General tree, 7.6 Define graph. 7.7 State graph. 7.8 Represent a graph as adjacency matrix adjacency list.	Explain routes, queued and non-directed Describe different types of graphs: circle, loops, etc. Describe operations such as proceeds, less than etc.	White board and Multimedia projector	Be able to write simple program to implement trees write simple program to implement graphs	Demonstrate how to write simple program to illustrate trees Demonstrate how to write simple program to illustrate graphs		Describe the various tree and graph operations
	General Objective 8: Understand different sorting and searching techniques						
13-15	8.1 Define sorting. 8.2 Explain the various sorting Techniques.	Explain sorting Explain Comparison based sorting Explain bubble sorting algorithm	White Board, PC and Multimedia projector	Be able to implement different sorting techniques in program	Guide students on how to write programs to implement different sorting techniques Guide students on how to	Explain the various sorting techniques	

		Explain selection sorting algorithm			Perform different sorting and searching Explain insertion sorting algorithm Explain linear and binary search algorithm techniques Apply sorting algorithm to sort an array of objects.		

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

ND I SECOND SEMESTER

Programme: National Diploma in Computer Engineering Technology		Course Code: EEC 124	Contact Hours: 45
Course: ELECTRONICS I	Semester: 1		Theoretical: 1 hour /week
Year: 1	Pre-requisite:		Practical: 2 hours /week
Goal: This course is intended to provide students with basic knowledge of thermionic and semi-conductor devices.			
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand the concept of thermionic emission. 2. Understand the simple concept of energy level in materials. 3. Know the operations, characteristics and applications of semi-conductor devices. 4. Understand the constructional features and configuration of bipolar junction transistors. 5. Understand how the triode and the bipolar transistor can be used as a single stage amplifier. 6. Understand the zener diode and thyristor as switching devices. 7. Understand the constructional features and operation of afield-effect transistor.			

	Theoretical Content			Practical Content:		
	GENERAL OBJECTIVE 1: Understand the concept of thermionic emission.					
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Practical Outcomes	Instructor's Activities	Evaluation
1 - 3	1.1 Explain the history of electronics. 1.2 Explain the process of thermionic emission. 1.3 Describe the applications of the thermionic valves 1.4 Explain the disadvantages and advantages of thermionic valves. 1.5 Explain the construction and principles of thermionic valves.	• Trace the evolution development of electronics • Identify the applications of the following thermionic valves: o Diode o Triode o Tetrode o Pentode o Hexode o Heptode o Octode • Make slide presentations on thermionic valves • Highlight recent trends in electronics	• Textbooks, multimedia projectors and screen, online resources, lecture notes, Charts, writing materials.			Explain the thermionic emission using the applications of the following thermionic valves: o Diode o Triode o Tetrode o Pentode o Hexode o Heptode o Octode
General Objective 2: Understand the simple concept of energy level in materials						

4 - 5	2.1 Outline energy levels in materials. 2.2 Explain valence and conduction bands. 2.3 Explain Fermi energy levels. 2.4 Distinguish between conductors, semiconductors and insulators, using Fermi-level concept. 2.5 Explain intrinsic and extrinsic semiconductors. 2.6 Explain carriers in semi-conductors. 2.7 Define majority and minority carriers. 2.8 Outline the effect of temperature on the conductivity of semi-conductors and conductors.	• Illustrate energy • levels in materials. • Explain Fermi energy levels. • Give examples of • conductors, semiconductors and insulators • Explain holes and electronics in semi-conductors. • Highlight new findings in semiconductor technologies • Give assignment to students on semiconductor devices.	• Textbooks, multimedia projectors and screen, online resources, lecture notes, Charts, writing materials.			Explain valence conductors, semiconductors and insulators, using Fermi-level concept. Explain the effect of temperature on the conductivity of semi-conductors and conductors.
General Objective 3: Know the operations, characteristics and applications of semi-conductor devices						

6 - 7	3.1 Explain P-N junction diode (Forward and Reverse bias). 3.2 Sketch forward and reverse characteristics of the P-N junction diode. 3.3 Explain silicon and germanium diode characteristics. 3.4 Explain zener diode characteristics. 3.5 Identify the circuit symbols for diode. 3.6 Identify various types of diodes physically. 3.7 Explain the following: i. The zener effect; and ii. Avalanche effect. 3.8 State application of zener diode (clipping, stabilization etc.) 3.9 Explain the operation, using the characteristics and symbol of the following: i. Tunnel diode; ii. Photo diode; iii. Thermistors. 3.10 State the applications of (i) to (iii) in 3.9 above.	• Explain the application of P-N junction diode in practical systems • Solve problems on the P-N junction diode (Forward and Reverse bias) • Explain silicon and germanium diode. • Introduce various types of diodes and analyze the use	• Textbooks, electronic books, projector and lecture notes. • Charts writing materials. • Practical manual and report book, electronic/ white board, projector and practical manual. • Charts writing materials.	• Perform experiment to determine V-I characteristics of the Silicon P-N junction diode. • Perform experiment to determine V-I characteristics of the zener diode.	• Demonstrate the P-N junction diode in practical systems using application • Solve problems on the P-N junction diode (Forward and Reverse bias) • Describe silicon and germanium diode. • Introduce various types of diodes and analyze the use	Explain the characteristics of silicon and germanium diode, zener diode Explain the circuit symbols for diode and its types.
General Objective 4: Understand the constructional features and configuration of bipolar junction transistors						
8 - 9	4.1 Explain the structure and operation of a bipolar transistor (NPN and PNP). 4.2 Explain the biasing	• Explain the application of a bipolar transistors in practical systems (PNP and	• Textbooks, electronic books, projector and lecture notes.	• Determine the input and output resistances, current and voltage gains from 4.4.	• Demonstrate the operation of bipolar transistors (NPN and	Explain the structure and operation of a bipolar transistor (NPN and PNP),

	arrangement of NPN and PNP bipolar transistors. 4.3 Explain the circuit configuration of NPN and PNP bipolar transistors and their biasing arrangement: i. The common base configuration. ii. The common collector configuration. iii. The common emitter configuration. 4.4 Sketch the static characteristics curves of NPN and PNP bipolar transistors for 4.3 (i) and 4.3 (iii). 4.5 Explain the input and output resistances, current and voltage gains from 4.4. 4.6 Explain the characteristic curve of NPN and PNP transistors.	NPN) • Solve problems on the bipolar junction transistors • Use appropriate circuit diagrams to discuss the applications and operational principle of thy NPN and PNP bipolar • Demonstrate the use of input and output resistances gains from NPN and PNP bipolar transistor • Draw the characteristic curve of NPN and PNP transistors • Highlight current development in bipolar junction transistor • Describe the factors for setting up semi-conductor industry	• Charts writing materials. • Practical manual and report book, Electronic trainers, circuit construction boards/decks, electronic components, power supply, oscilloscopes, multimeter, electronic/ white board, projector, practical manual, charts and writing materials.	• Determine by experiments the characteristic curve of NPN and PNP transistors.	PNP). • Illustrate bipolar transistors in practical systems (PNP and NPN) • Guide students to use appropriate circuit diagrams to discuss the applications and operational principle of thy NPN and PNP bipolar • Demonstrate the use of input and output resistances gains from NPN and PNP bipolar transistor • Draw the characteristic curve of NPN and PNP transistors	-the biasing arrangement of NPN and PNP bipolar transistors: i The common base configuration. ii. The common collector configuration. iii. The common emitter configuration
General Objective 5: Understand how the triode and the bipolar transistor can be used as a single stage amplifier						
10-11	5.1 Explain the fixed biasing arrangement of a single state transistor amplifier. 5.2 Explain how to draw the	• Explain basic circuit schematics • Describe breadboards and	• Textbooks, electronic books, projector and	• Determine by experiment the voltage gain of a common emitter.	• Explain the procedures to be followed	Draw the load line (D.C & A.C.) output.

	load line (D.C & A.C.) output characteristic curve of a bipolar transistor. 5.3 Explain how to use the characteristic curves to determine the following: i. A.C current gain; ii. A.C. Voltage gain iii. A.C. Power gain	multisim exercises • Explain the use of characteristic curves to determine A.C current gain, voltage gain and power gain.	lecture notes. • Charts writing materials. • Practical manual and report book, Electronic trainers, circuit construction boards/decks, electronic components, power supply, oscilloscopes, multimeter, electronic/ white board, projector, practical manual, charts and writing materials.		to the students • Assign students into groups	List the characteristic curve of a bipolar transistor. Explain the use of the following: i. A.C current gain; ii. A.C. Voltage gain iii. A.C. Power gain
General Objective 6: Understand the zener diode and thyristor as switching devices						
12-13	6.1 Explain basic structure of the thyristor and the zener diode. 6.2 Explain the working principle of the thyristors and the zener diode. 6.3 List the application of the thyristor and the zener diode. 6.4 State the advantages of the thyristor switch over other types of electromechanical	• Analyze the structure of the thyristor and the zener diode • Explain different types of thyristor and the zener diode application • List software packages to analyse and simulate electronic components and	• Textbooks, electronic books, projector and lecture notes. • Charts writing materials. • Practical manual and report book, Electronic trainers, circuit construction	• Verify by experiment the operation of a zener diode as a voltage stabilizer.	• Assign students into groups • Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in	• List the advantages of the thyristor switch over other types of electromechanical switches.

	switches e.g. relay mechanical switches. 6.5 Explain the operation of zener diode as voltage stabilizer.	devices •	boards/decks, electronic components, power supply, oscilloscopes, multimeter, electronic/ white board, projector, practical manual, charts and writing materials.		standard laboratory notebook • Assess the students practical works and add appropriate comments	
General Objective 7: Understand the constructional features and operation of afield-effect transistor (FET)						
14-15	7.1 Explain the basic constructional features of FETs. 7.2 Explain the different between depletion and enhancement modes. 7.3 Plot the output and transfer characteristics from given data. 7.4 State the precautions necessary when using FETs. 7.5 Describe the output characteristic of a common source of FETs. 7.6 Explain voltage gain, input and output resistance from output characteristic in 7.6 above. 7.7 Compare the properties of a FET with that of a	• Explain the basic operation of junction gate and insulated v gate • Differentiate between depletion and data • Outline and explain the precautions necessary whey using field-effect transistor (FET) • Describe software packages to analyse and simulate electronic components and devices • Describe new variants of FETs	• Textbooks, electronic books, projector and lecture notes. • Charts writing materials.	• Determine by experiment, the output characteristic of a common source FET. • Obtain voltage gain, input and output resistance from output characteristic in 7.6 above.	• Explain the procedures to be followed to the students • Identify the set of equipment to be used for each experiment • Relate the theory to the experiments to be performed • Assign students into	Compare the properties of a FET with that of a triode valves and bipolar transistors. What is the use of bipolar and FET as switching devices using characteristics curves

	triode valves and bipolar transistors. 7.8 Explain the use of bipolar and FET as switching devices using characteristics curves.				groups	

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: EEC 125	CONTACT HRS: 45 HRS
COURSE: ELECTRICAL ENGINEERING SCIENCE II	COURSE UNIT 3.0	
Goal: This course is intended to provide students with basic knowledge of Electrical Engineering Science.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand the concept of magnetism and magnetic circuits. 2. Understand the concept of electromagnetism and electromagnetic induction. 3. Understand the concept of inductance and its application. 4. Understand the fundamentals of A.C. theory.		

Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE 1: Understand the concept of electric current flow.						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
GENERAL OBJECTIVE 1: Understand the concept of magnetism and magnetic circuits						
1-3	1.1 Define magnetic flux, magnetic flux density magneto motive force, magnetic field strength, reluctance, permeability of free space magnetic constants relative permeability. 1.2 State the symbols, units and relationships of terms in 1.1 1.3 Draw the electrical equivalent of magnetic circuit with or without air-gap. 1.4 State analogies between electrical and magnetic circuits. 1.5 Solve simple magnetic circuit problems. 1.6 Distinguish between soft and hard magnetic materials.	State the symbols, units and relationships of terms in1,1 Solve simple magnetic circuit problems.	White Board, textbooks, lecture notes, Internet sites, PC loaded with Presentation software package and connected to multimedia Projector, calculator		•	
GENERAL OBJECTIVE 2: Understand the concept of electromagnetism and electromagnetic induction						
4-7	2.1 Explain the magnetic affect of electric current. 2.2 Explain magnetic fields around straight conductors, adjacent parallel conductors and solenoids. 2.3 Explain the force on a current	Draw magnetic fields around straight conductors, adjacent parallel conductors and	White Board, textbooks, lecture notes, Internet sites,	Demonstrate by experiment the magnetic effect of a current carrying conductor in a magnetic field.	• Explain the procedures to be followed to the students • Identify the set of equipment to be used for	

	carrying conductor in a magnetic field. 2.4 State the direction of the force in 2.3 2.5 Derive the expression for the magnitude of the force in 6.4 (i.e F = mBIL newton) 2.6 Explain the concept of electromagnetic induction. 2.7 State Faraday's Laws of electromagnetic induction. 2.8 State Lenz's law of electromagnetic induction. 2.9 Derive the expressions for magnitude of e.m.f induced in a conductor or a coil. 2.10 State the applications of electromagnetic induction.	solenoids Solve problems involving 2.6 to 2.10 above.	PC loaded with Presentation software package and connected to multimedia Projector, calculator Basic Electricity Trainers, Electronic Trainers, Oscilloscopes, Digital/Analogue Multimeters, Ammeters, Voltmeters, Potentiometers, Wheatstone bridges, Rheostats, Variacs, Wattmeter	Verify by experiments Faraday's & Lenz's laws	each experiment • Relate the theory to with the experiments to be performed • Assign students into groups	
GENERAL OBJECTIVE 3: Understand the concept of inductance and its application						
8-11	3.1 Define self and mutual inductances. 3.2 State the symbols and units of the terms in 3.1 above.	Solve problem involving 3.3 to 3.6.	White Board, textbooks, lecture notes, Internet	Determine by experiment the inductance of a coil.	• Provide practical manuals and reporting guidelines to the students	

	3.3 State the expression for the equivalent inductance of inductances connected in series and in parallel. 3.4 State the expression for the induced voltage across an inductor. 3.5 State the expression for the inductance in inductive coupled coils connected in series aiding or opposing. 3.6 Derive an expression for energy stored in an inductor. 3.8 Describe using suitable diagram the operation of the induction coiled in a car ignition system.		sites, PC loaded with Presentation software package and connected to multimedia Projector, calculator, Basic Electricity Trainers, Electronic Trainers, Oscilloscopes, Digital/Analogue Multimeters, Ammeters, Voltmeters, Potentiometers, Wheatstone bridges, Rheostats, Variacs, Wattmeter	Determine by experiment energy loss in an inductor.	• Ensure students activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments • Encourage students to be creative and innovative in their practical works	
GENERAL OBJECTIVE 4: Understand the fundamentals of A.C theory						
12-15	4.1 Describe the production of alternating e.m.f by a rotating coil in a magnetic field. 4.2 Define r.m.s.	Sketch a.c. waveforms both to scale and not to scale. State advantages	White Board, textbooks, lecture notes,	Demonstrate by experiment the relationship between the following	• Explain the procedures to be followed to the students • Identify the set	

	instantaneous, average, and peak valves, period, frequency of an a.c. waveform. 4.3 State relationship between instantaneous and peak values of a sinusoidal wave. 4.4 Solve problems graphically on a.c. circuits with different combinations of resistance, inductance and capacitance. 4.5 Differentiate between series parallel resonance. 4.6 Explain phase lag or phase lead as applied to a.c circuits. 4.7 Explain the difference between single-phase and three-phase supply. 4.8 State advantages and disadvantages of three phase supply over single phase supply.	and disadvantages of three phase ac supply over single phase supply. Solve problems involving 4.2 to 4.3. Write simple computer programs to problems related to a.c circuits	Internet sites, PC loaded with Presentation software package and connected to multimedia Projector, calculator, Basic Electricity Trainers, Electronic Trainers, Oscilloscopes, Digital/Analogue Multimeters, Ammeters, Voltmeters, Potentiometers, Wheatstone bridges, Rheostats, Variacs, Wattmeter	frequency, period and amplitude of sinusoidal wave. Determine by experiment the Q-factor of circuit containing R,L, and C in (a) series, (b) parallel.	of equipment to be used for each experiment • Relate the theory to with the experiments to be performed • Assign students into groups • Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments	

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: **CTE 121**	**CONTACT HRS: 45 HRS**
COURSE: DIGITAL COMPUTER FUNDAMENTAL I	**COURSES UNIT 3.0**	
Goal: This course is designed to provide students with the knowledge of the principles of Boolean Algebra in the operations and applications of logic devices.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1.0 Understand the concept of data and information presentation in digital system. 2.0 Understand the different codes used in digital system. 3.0 Know the fundamentals of Boolean Algebra. 4.0 Understand the various methods of minimization required to simplify digital combinational circuits. 5.0 Understand basic digital functions.		

Theoretical Content			**Practical Content**			
GENERAL OBJECTIVE 1: Understand the concept of data and information presentation in digital system.						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Practical Outcomes	Instructor's Activities	Evaluation
1-3	1.1 Define digits of a number. 1.2 Explain the base of a number. 1.3 List the number of digits of figures available in various number systems: Base 10, Base 8, Base 2, Base 16. 1.4 Outline the significance of weighting of digits in a number system. 1.5 Convert other number system to decimal and vice-versa. 1.6 Explain why binary number system is used in digital system. 1.7 State the special relationship between binary, octal and hexadecimal. 1.8 Explain the advantages of octal and hexadecimal over the binary data. 1.9 Describe the various binary based codes: BCD Code, Excess -3 code, Gray code, ASCII code, Seven-Segment display and Unicode.	Describe special relationship between binary, octal and hexadecimal. State the advantages of octal and hexadecimal over the binary data. Explain BCD Code, Excess -3 code, Gray code, ASCII code and Seven-Segment display code.	• Textbooks, electronic books, projector and lecture notes. • Charts writing materials, digital systems, logic tutors, DC power supplies, Oscilloscopes, Function generators, digital multimeters	Perform practical exercises in problems involving the conversion from one number system to another.	• Assign students into groups • Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments	

GENERAL OBJECTIVE 2: Understand the different codes used in digital system.						
4-6	2.1 Explain the following binary operation, additions, subtraction, multiplication and division. 2.2 Explain signed binary number system. 2.3 Explain the difference between the representation of positive and negative numbers in sign magnitude notation. 2.4 Define N's complement where N is any number. 2.5 Perform addition and subtraction using 1's complement. 2.6 Explain the limitation of 1's complement. 2.7 Explain 2's complement. 2.8 Perform addition and subtraction using 2's complement. 2.9 Identify fixed point and floating point numbers. 2.10 Explain the mantissa and characteristic of a floating point number.	Describe how to perform addition and subtraction using 1's complement. Explain the limitation of 1's complement. Explain 2's complement. Perform addition and subtraction using 2's complement. Solve problems involving number systems.	• Textbooks, electronic books, projector and lecture notes. • Charts writing materials, digital systems, logic tutors, DC power supplies, Oscilloscopes, Function generators, digital multimeters	Perform addition and subtraction using 1's complement. Perform addition and subtraction using 2's complement. Demonstrate practically binary operations	• Explain the procedures to be followed to the students • Identify the set of equipment to be used for each experiment • Relate the theory to the experiments to be performed • Assign students into groups	
GENERAL OBJECTIVE 3: Understand the various methods of minimization required to simplify digital combinational circuits.						
7-9	3.1 Explain Venn's diagram. 3.2 Use the Venn's diagram to explain: i. Union of a set. ii. Intersection of a set iii.Universal sets	Use Venn's diagram to explain: i. Union of a set. ii. Intersection of a set ii. Universal sets iii. Complement of a	• Textbooks, electronic books, projector and lecture notes. • Charts writing	Implement digital circuits using AND and OR gates:	• Explain the procedures to be followed to the students • Identify the set of	

	i. Complement of a set 3.3 Apply venn's diagram to simplify Boolean expression. 3.4 Use Duality of a switching function to prove Boolean identity laws. 3.5 Explain the complement of function. 3.6 Solve problems by finding the complement of various functions using duality-method. 3.7 Explain the principles of karnaugh map. 3.8 Draw karnaugh map for two three and four variables. 3.9 State the advantages of Karnaugh map techniques for simplification of Boolean Algebra. 3.10 State Boolean Algebra postulations for: AND, OR, and NOT expressions. 3.11 Sketch logic diagram that implement the logic expression in 3.10 above using 'AND' 'OR' and 'NOT' gates 3.12 Explain the importance of minimization in digital system design. 3.13 Use Boolean Algebraic method to reduce a given Boolean equation having	set Explain how to use Venn's diagram to simplify Boolean expression. Explain duality of a switching function to prove identities.	materials, digital systems, logic tutors, DC power supplies, Oscilloscopes, Function generators, digital multimeters		equipment to be used for each experiment • Assign students into groups • Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory notebook	

	up to four variables to its simplest form. 3.14 Sketch logic diagram that implement the simplified logic expression in 3.13 above using 'AND' 'OR' and 'NOT' gates					
GENERAL OBJECTIVE 4: Know the fundamentals of Boolean Algebra						
10-12	4.1 State the Boolean postulates: The commutative laws, Associative laws, Identity laws, Distributive laws, Negation law and De Morgan's theorem. 4.2 Define the truth table. 4.3 Construct a truth table for up to 4 variables. 4.4 Form logic expression from statement of conditions. 4.5 Define a Karnaugh map (K-map).	Explain the Boolean law: commutative laws, Associative laws, Identity laws, Distributive laws, Negation law and De Morgan's theorem. Explain the truth table and construction of truth table Describe how to use Karnaugh map (K-map).	• Textbooks, electronic books, projector and lecture notes. • Charts writing materials, digital systems, logic tutors, DC power supplies, Oscilloscopes, Function generators, digital multimeters		• Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments	
GENERAL OBJECTIVE 5: Understand basic digital functions.						
13-15	5.1 Explain how YES/NO, TRUE/FALSE, ON/OF can be coded by '1' and '0' 5.2 Explain the operations of AND, OR and NOT notations using truth table	Describe logic gate symbols to represent AND, OR, NOT NAND and NOR Solve problems involving basic logic functions.	• Textbooks, electronic books, projector and lecture notes. • Charts writing materials,		• Explain the procedures to be followed to the students • Identify the set of equipment to	

	and logic gates 5.3 Draw logic switch circuit to represent AND, OR, NOT, NAND, NOR, XOR and XNOR gates.	Illustrate with a well labeled diagram, the operations and functions of logic gates: AND, OR, NOT, NAND, NOR, XOR and XNOR using switches and bulbs.	digital systems, logic tutors, DC power supplies, Oscilloscopes, Function generators, digital multimeters		be used for each experiment • Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory notebook	

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 122	CONTACT HRS: 45 HRS
COURSE: ELECTRICAL MEASUREMENT & INSTRUMENTATION I	COURSE UNIT 3.0	
Goal: This is intended to provide students with the basic knowledge and skill in measurement and measuring instruments.		
GENERAL OBJECTIVE: On completion of this module, the student should be able to: 1. Know the various types of indicating instruments. 2. Know the basic structure of an electromechanical instrument. 3. Understand the operation and construction of a permanent magnetic-moving coil instrument. 4. Understand the construction and principle of operation of ohmmeter, megger and multimeters 5. Understand the use of potentiometer for the measurement of electrical quantities in d.c and a.c circuits. 6. Understand the theory of errors in measurement and its applications. 7. Understand the construction, principles of operation and use of cathode ray oscilloscope (CRO).		

Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE 1: Know the various types of indicating instruments.						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Practical Outcomes	Instructor's Activities	Evaluation
1-2	1.1 Describe various types electromechanical of instruments. 1.2 State various types of electronic instruments. 1.3 Explain the typical applications of electromechanical and electronic instruments.	Identify various electromechanical and electronic instruments. State the typical applications of electromechanical and electronic instruments.	• Textbooks, electronic books, projector and lecture notes, Charts writing materials, measuring instruments , DC power supplies, Oscilloscopes, Function generators, Internet services			
GENERAL OBJECTIVE 2: Know the basic structure of an electromechanical instrument.						
3-4	2.1 State the common devices used in an electromechanical instrument e.g Deflection, Controlling and Damping devices. 2.2 Describe the types of controlling devices i.e spring control and gravity control. 2.3 Describe the methods of damping e.g. i. Eddy current damping. ii. Air viscous damping.	State the common devices used in an electromechanical instrument List types of controlling devices Enumerate methods of damping State three basic deflecting	• Textbooks, electronic books, projector and lecture notes, Charts writing materials, measuring instruments , DC power supplies, Oscilloscopes, Function generators, Internet services	Calibrate by experiments electro-dynamic ammeter, voltmeter and wattmeter.	• Explain the procedures to be followed to the students • Identify the set of equipment to be used for each experiment • Assign students into groups • Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory	

	iii. Oil viscous damping. 2.4 Describe the three basic deflecting systems used in electromechanical instruments. i. Permanent magnet-moving coil d'Arsonval ii. Moving iron system. iv. Electro-dynamics' system.	systems used in electromechanical instruments.			notebook	
GENERAL OBJECTIVE 3: Understand the operation and construction of a permanent magnetic-moving coil instrument.						
5-7	3.1 Explain with sketches the operation of a permanent-magnet moving coil instrument (P.M.M) using contrawound and spring control. 3.2 Describe permanent-magnet moving coil ammeters and voltmeters. 3.3 Explain the use of shunts and multipliers with ammeters and voltmeters to extend the ranges. 3.4 Explain the limitations of the simple p.m.m in measuring high values of voltage and currents.	Draw permanent-magnet moving coil ammeters and voltmeters. Connect shunts and multipliers with ammeters and voltmeters to extend the ranges. Calculate the value of the multiplier and shunt resistance for a given application. Highlight the operations of	• Textbooks, electronic books, projector and lecture notes, Charts writing materials, measuring instruments , DC power supplies, Oscilloscopes, Function generators, Internet services	Measure resistance using ohmmeters and meggers.	• Assign students into groups • Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments	

	3.5 Calculate the value of the multiplier and shunt resistance for a given application. 3.6 Describe the operation of instrument transformers.	instrument transformers.				
GENERAL OBJECTIVE 4: Understand the construction and principle of operation of ohmmeter, megger and multimeter						
8-9	4.1 Describe with the aid of diagram the construction of ohmmeter and megger. 4.2 Explain the operation of ohmmeter and megger.	Use project to display the construction of ohmmeter and megger. Highlight the functions of ohmmeter and megger State the difference between ohmmeter and megger	• Textbooks, electronic books, projector and lecture notes, Charts writing materials, measuring instruments , DC power supplies, Oscilloscopes, Function generators, Internet service	Measure resistances using ohmmeter, merger and multimeter	• Assign students into groups • Provide practical manuals and reporting guidelines to the students • Ensure students activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments	
GENERAL OBJECTIVE 5: Understand the use of potentiometer for the measurement of electrical quantities in d.c and a.c circuits.						
10-11	5.1 Describe the slide wire potentiometer. 5.2 Explain the method of standardization using potentiometer. 5.3 Describe the measurement of low resistance, and voltage using potentiometer. 5.4 Describe the calibration	Explain types of potentiometer. Explain the concepts and principles of calibration Identify commercial type	• Textbooks, electronic books, projector and lecture notes, Charts writing materials, measuring instruments , DC power	Measure voltage using slide wire potentiometer.	• Explain the procedures to be followed to the students • Identify the set of equipment to be used for each experiment • Relate the theory to the experiments to be performed • Assign students into	

	of ammeter and voltmeter using a potentiometer. 5.5 Describe the commercial type of d.c. potentiometer.	of d.c. potentiometer.	supplies, Oscilloscopes, Function generators, Internet service		groups	
GENERAL OBJECTIVE 6: Understand the theory of errors in measurement and its applications.						
11-12	6.1 State different types of errors (random systematic errors). 6.2 Define random and systematic errors. 6.3 Give examples of each of errors in 6.2. 6.4 Calculate errors in compound quantities i.e. absolute error, fractional errors, errors in sum, errors in a difference, errors in products and errors in quotients.	Describe different types of errors (random systematic errors). Calculate errors in compound quantities i.e. absolute error, fractional errors, errors in sum, errors in a difference, errors in products and errors in quotients.	• Textbooks, electronic books, projector and lecture notes, Charts writing materials, measuring instruments , DC power supplies, Oscilloscopes, Function generators, Internet service			
GENERAL OBJECTIVE 7: Understand the construction, principles of operation and use of cathode ray oscilloscope (CRO).						
13-15	7.1 Draw a simplified block diagram of a C.R.O. 7.2 Explain the function of each blocks in 7.1: i. Cathode ray tube; ii. Vertical and horizontal	Explain a simplified block diagram of a C.R.O Illustrate with a well labeled	• Textbooks, electronic books, projector and lecture notes, Charts writing materials,	Measure voltage, frequency and amplitude of a.c and d.c using C.R.O	• Assign students into groups • Provide practical manuals and reporting guidelines to the students • Ensure students	

	amplifiers; iii. Time-base trigger block; iv. Sweep generator blocks; v. Signal delay block; vi. Sweep delay block. 7.3 Draw well labeled diagram of a cathode ray tube. 7.4 Explain the function of each parts of the cathode ray tube. 7.5 Explain how C.R.O can be used to measure: i. d. c. voltage. ii. a.c voltage. iii. Infrequency of sinusoidal waveform. 7.6 Explain the use of probes to get the best possible signal on the scope.	diagram, the operations and functions of a cathode ray tube.	measuring instruments , DC power supplies, Oscilloscopes, Function generators, Internet service		activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments	

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 123	CONTACT HOUR: 45 HRS
COURSE: COMPUTER/ELECTRONIC MAINTENANCE AND REPAIRS	Semester:2	Theoretical:1 hour/week
Year: 1	Pre-quisite:	Practical: 2 hrs
Goal: This course is designed to provide students with practical knowledge and skills in maintenance and repairs of electronic/computer equipment.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand the general use of tools and testing instruments. 2. Understand cabling, jointing soldering and de-soldering techniques. 3. Know different electronic circuit components 4. Use manufactures service manual and circuit wiring diagrams. 5. Maintain GSM phones. 6. Use of Uninterruptible Power Supply (UPS) and Automatic Voltage Regulators (AVR)		

	Theoretical Content			Practical Content		
General Objective 1: Understand the general use of tools and testing instruments						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-2	1.1 Identify the following test instruments: i. Multi-tester; ii. Transistor tester; iii. Oscilloscope; iv. Electronic voltmeter instruments. 1.2 Explain the uses of the items in 1.1 above	• List, sketch and state the applications of each test instrument in 1.1 • Describe with the students in more details the use items in 1.1.	• Textbooks • Instrument catalogs • Instrument user manuals. • Multi-tester; • Transistor tester; • Oscilloscope; • Electronic voltmeter instruments. • Practical manuals	• Carry out identification of items in 1.1 • Show competence in the use of items in 1.1	• Teacher demonstrates the use of items in 1.1 • Ask students to identify and demonstrate the use of items in 1.1	Explain the use of Multi-tester; Transistor tester Oscilloscope and Electronic voltmeter instruments
General Objective 2: Understand cabling jointing soldering and de-soldering techniques						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
3-6	2.1 Explain the types of cables used in; i) Power supply ii) Communication between systems. iii) Communication between systems and peripherals.	• Describe cables, discuss in details the what is meant by the term cabling as well as steps for cabling • Describe with illustration details of items in 2.2, 2.3 and 2.4	• Textbooks • Journals • Soldering iron • Lead • Lead sucker • Cutter • Vero boards • components required for selected circuits • RJ45connector	• Perform the procedure and techniques in 2.3 and 2.3. • Wire up and solder componen t to make simple	• Demonstrate the procedure and techniques in 2.2 and 2.3. • Ask students to demonstrate the procedure and techniques in 2.2 and 2.3 • Guide students to carry out the	1Explain the types of cables used in; -Power supply Communication between systems. Communication between systems and peripherals. •

	2.2 Outline cabling procedure and practice. 2.3 Explain the types of cables, choice and methods of testing, as well as the instruments used for testing: i) Twisted pair cables ii) Coaxial cables RS-232 standard communicatio n cables 2.4 Explain the following: a. Jointing techniques; b. Soldering and disoldering techniques; c. Crimping and fastening method.		• Crimping • tools • Communication cables • Practical manuals	electronic circuits. • Carry out de-soldering • Carry out each techniques in 2.4	procedure and techniques in 2.4	
General Objective 3: Know different circuit components						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
7-8	3.1 Identify values of resistors and capacitors using colour codes. 3.2 List different types of resistors	• Explain how to determine values of resistors and capacitors using colour codes. • List different	• Textbooks • Assorted Resistors • Assorted Capacitors • Assorted	• Determine the values of resistors and capacitors	• Ask students to determine the values of resistors and capacitors using colour codes.	• What is the uses of resistors and capacitors using colour codes Explain the value of the following electronic components;

	(carbon, wire-wound, ketal oxide etc. and capacitors. 3.3 Identify the following electronic components; i. Transistors; ii. Diodes; i. Integrated circuit (IC's); ii. Resistors by their preferred values and power rating. iii. Capacitors by their working voltage and types. 3.4 Explain open-circuit and short-circuit defects in components listed in 3.3. 3.5 Outline various methods of testing components: a. In-circuit. b. Out of circuit.	types of resistors and capacitors in 3.2 • Using catalog, explain the various available preferred values of items in 3.3	Transistors • Assorted diodes • Assorted logic ICs • Digital multimeters • Practical manuals	using colour codes. • Carry out test for each componen t in 3.3 using techniques in 3.5	• Demonstrate and carry out test for each component in 3.3 using techniques in 3.5	i. Transistors; ii. Diodes; i. Integrated circuit (IC's); ii. Resistors by their preferred values and power rating. iii. Capacitors by their working voltage and types.
General Objective 4: Understand the use of manufactures service manual and circuit wiring diagrams						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation

9-11	4.1 Explain fault tracing in circuits 4.2 Outline trouble shooting and fault isolating techniques. 4.3 List observation test method: i. Visual; ii. Touch; iii. Smell; iv. Hearing. 4.4 Explain D.C and A.C signal testing. 4.6 Explain stage or module by substitution.	• List, explain observation test methods listed in 4.1	• Textbooks, • manufactures service, • manual and circuit wiring diagrams. • manufactures service manual • circuit wiring diagrams • logic probe • oscilloscope • Digital multimeters • Replaceable modules • Practical manuals	• Carry out fault tracing by observation methods • Perform test to identify faulty components by measurement (voltage and resistance test). • Replace faulty components.	• Demonstrate and instruct students to carry out fault tracing by observation methods • Demonstrate and guide students to identify faulty module by measurement (voltage and resistance test).	• List types of trouble shooting and fault isolating techniques and observation test method
General Objective 5: Know the maintenance of GSM phones						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
12-13	5.1 Identify various mobile phone (GSM) accessories and their function 5.2 Explain the various mobile phone (GSM) accessories and their functions 5.3 Identify common GSM hardware	• Describe the function and use of hands free/headset, earpiece, external Bluetooth, chargers, batteries, etc, • List and describe common GSM hardware problems listed in	• Textbooks, • Catalogs • Phone manuals • Good and Scrap mobile phones • Workstation • Data cable • Phone manuals • Precision set • Allen key set	• Perform the following on GSM phones: - Troubles hooting, - Dismantling, - Assemble and - Test • Perform fault finding using	• Demonstrate and guide students to solve common hardware problems stated in 5.2 • Demonstrate and guide students to resolve common hardware	• Describe common GSM hardware problems related to mouthpiece, earpiece, charging port, keyboard and damage screen, vibrator. • Describe common GSM software problems such as SIM rejection, phone lock, invalid SIM , hanging,

	problems related to mouthpiece, earpiece, charging port, keyboard and damage screen, vibrator, etc 5.4 Identify common GSM software problems such as SIM rejection, phone lock, invalid SIM , hanging, restarting etc.	5.2 • List and describe common GSM software problems listd in 5.3	• Magnifying desk lamp • Service provider chart codes • Ultrasonic cleaner • Flashing and unlocking devices/computer softwares • Practical manuals	software.	problems stated in 5.3	
General Objective 6: Understand the use of Uninterruptible Power supply (UPS) and Automatic voltage regulators (AVR)						
Week	Specific Learning Outcomes	Teacher's Activities	Learning Resources	Specific Learning Outcomes	Specific Learning Outcomes	Teacher's Activities
14-15	6.1 Briefly explain the operation of a UPS and AVR for steady power supply in computer system. 6.2 Explain the process of cooling and the essence of having good ventilation and cooling systems. 6.3 Explain maintenance of batteries and	• Explain the applications of UPS with emphasizes on battery usages, charging, and effect of UPS over loading • Describe different methods of cooling and ventilation in computer power system	• Textbooks • UPS • AVR • Good and bad UPS batteries • Good and open circuited power cords • Practical manuals/guide	• Demonstrate faults diagnoses in UPS and AVR	• Demonstrate the common faults in UPS such as bad battery, power cord open circuit, etc	What is the process of cooling and what is the essence of having good ventilation and cooling systems.

	battery chargers					

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

COURSE TITLE: TECHNICAL REPORT WRITING	Course Code: CTE 124	UNIT:2	CONTACT HOURS: 2
THEORETICAL: 2 HOURS/WEEK		PRACTICAL: 0 HOURS/WEEK	
YEAR/SEMESTER: ND I/2nd	PRE-REQUISITE:-None		PRACTICAL: 0 HOURS/WEEK
Goal: The course is design to enable students acquire basic knowledge of Technical Report Writing. GENERAL OBJECTIVES: On completion of this course, the student will be able to: 1. Understand the concept of proposal writing 2. Know content of a Technical Report 3. Understand the information that is required in technical report writing			

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY						
COURSE TITLE: TECHNICAL REPORT WRITING		COURSE CODE: CTE 124	UNIT: 2	CONTACT HOURS: 30		
THEORETICAL: 2 HOURS/WEEK				PRACTICAL: 0HOURS/WEEK		
YEAR/SEMESTER: ND I/ 2nd		PRE-REQUISITE:-				
Goal: The enable the students acquire basic knowledge of Technical Report Writing						
THEORETICAL CONTENTS		PRACTICAL CONTENTS				
WK	Specific Learning Objectives	Teacher's Activities	Resources	Specific Learning Objectives	Teacher's Activities	Evaluation
	GENERAL OBJECTIVE 1: Understand the concept of proposal writing					
	1.1 Explain the purpose of the following sections in writing project proposal: - Clients requirement - Specification - Proposed drawing - Cost estimate of materials, labour etc. - Execution period. 1.2 Write samples of project proposals based on the items listed in (1.1).	• Let the students know the importance of each sections in writing project proposal • Ask students to list various clients requirement with their specifications of the proposed diagram	Lecture notes, video clips and Multimedia, Internet, Whiteboard, textbooks			
	GENERAL OBJECTIVE 2: Know content of a Technical Report					
1-7	2.1 Define technical reports 2.2 Identify the purpose of technical reports. 2.3 Explain types and uses of technical reports. 2.4 Explain the methodology and sequence of writing technical report. 2.5 Preliminary sections of technical reports: Table of	Explain to the students activities 1.1-1.7	Lecture notes, video clips and Multimedia	-	-	-

	contents, certification page, list of Tables, list of Figures, etc. 2.6 Explain the methods of determining the following in technical reports: i. Topic and title justification of title; ii. abstract or synopsis of the report iii. aim and objectives of the report classification of data - scope and limitation of project iv. Data analysis (graphical method, tabular method a. descriptive b. method) v. Presentation of a. data (use of b. appendices) clearly 2.7 Explain how to write and correct key sections of final year project: - Introduction - Literature review - Methodology - Results & discussions - Conclusions.					
	General Objective 3: Understand the information that is required in technical report writing					
8-15	3.1 Explain the various types of information that would be required in reports.	Explain to the students activities 3.1-3.14.	Lecture notes, video clips and Multimedia			

	3.2 Determine the factors that influence solutions. 3.3 Explain conclusions arising from factors 3.4 Select criteria required in case studies. 3.5 Determine critical analysis of case studies. 3.6 Produce summary. 3.7 Make propositions (Author's propositions) 3.8 Develop conclusion to a technical report. 3.9 Write references and bibliography in standard format. 3.10 Explain terms of reference in report. 3.11 Explain the difference between facts and opinions. 3.12 Explain how facts and opinions may be distinguished in writing report. 3.13 Write reports on selected technical matters. 3.14 Rewrite the Abstract.					

Assessment:

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) progress tests for feedback.	20
Assignment	At least Two (2) assignment to be assessed by the teacher	20
Total		100

ND II THIRD SEMESTER

Programme: National Diploma in Computer Engineering Technology	Course Code: EEC 234	Contact Hours: 45 Hours
Course: ELECTRONICS II	Semester: 3	Theoretical: 1 hour /week
Year: II	Pre-requisite: Electronic I	Practical: 2 hours /week
Goal: This course is designed to enable students to acquire the basic knowledge operation of amplifier, oscillators, switching circuits and power supplies		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand the operation of signal amplifiers. 2. Understand the general principles of feedback and oscillators. 3. Apply the principles of switching circuits. 4. Know the action of basic electronic logic gates. 5. Understand the basic circuits used in power supplies.		

	Theoretical Content			Practical Content		
	GENERAL OBJECTIVE 1: Understand the operation of signal amplifiers.					
Week	**Specific Learning Outcomes**	**Teacher's Activities**	**Learning Resources**	**Specific Learning Outcomes**	**Teacher's Activities**	**Evaluation**
1-3	1.1 Explain different types of biasing arrangement of transistor amplifier: i. Fixed bias. ii. Collector-base bias without and with a decoupling capacitor. iii. Potential divider bias. iv. Junction FET simple bias. 1.2 Draw the circuit diagram of a single stage common emitter and source transistor amplifiers having resistive load, transformer and tuned circuit loads. 1.3 Calculate the voltage and power gains of the amplifiers in 1.2 above. 1.4 Explain the principle of operation of the circuit in 1.2 above. 1.5 Explain the principles and methods of interstage coupling: i. Resistance-capacitive coupling. ii. Direct coupling iii. Transformer coupling. 1.6 List the application of the different coupling methods. 1.7 Explain with a sketch, the	• Explain the concept of biasing and its effect on transistor operation. • Identify the operation regions on the output characteristics of the transistor. • Explain the operation mechanism of various bias circuits • Explain the effect of load type on the amplifier gain and impedances • Show the effect of decoupling capacitor on the gain of the amplifier. • Describe the common areas of application of the coupling methods • Explain the different classification of amplifiers and their	Marker, White board, Recommended textbooks, Lecture Notes, Power supplies, transistors (BJT, FET), bias resistors and capacitors), function generator, voltmeter, ammeter, connecting cables.	• Determine by experiments the performance of amplifiers using different biasing methods. • Determine by experiment the gain/frequency curve of a transistor amplifier.	• Guide students through experiments to determine amplifier gain using different bias methods; i. Fixed bias ii. Collector-base bias iii. Potential divider bias. • Estimate the gain of two stage amplifier using • Direct coupling • Capacitive coupling • Transformer coupling	Explain different types of biasing arrangement of transistor amplifier. Fixed bias. Collector-base bias without and with a decoupling capacitor. Potential divider bias. Junction FET simple bias.

	frequency response of the coupling methods in 1.5. 1.8 Explain the biasing conditions for classes A, B, AB, and C amplifiers. 1.9 List the main applications of each type of amplifier in 1.8 above. 1.10Explain the operation of simple push-pull amplifier: i. Transformer-coupled. ii. Transformer less coupling.	applications • Estimate the efficiencies of class A, B, AB and C amplifier classes • Give assignments to students on classifications of amplifiers				
General Objective 2: Understand the general principles of feedback and oscillators						
4-6	2.1 Draw the block diagram of a basic feedback amplifier. 2.2 Define positive and negative feedback in amplifiers. 2.3 Explain the general expression for stage gain of a basic feedback amplifier. 2.4 State the effect of applying negative feedback to an amplifier in relation to: i. Gain. ii. Gain stability. iii. Bandwidth. iv. Distortion. v. Noise. vi. Input and output resistance. 2.5 Explain how oscillations can be produced by an amplifier with positive feedback. 2.6 Explain the operation of:	• Explain positive and negative feedback in systems • Obtain from the block diagram, how the general expression for feedback is obtained. • State the effect of feedback on gain and stability of a system. • Explain the operation, types and uses of oscillators • Draw and explain the RC phase shift oscillator • Draw and explain	Marker, White board, Recommended textbooks, Lecture Notes Power supplies, transistors (BJT, FET), bias resistors and capacitors), function generator, voltmeter, ammeter, connecting cables.	• Determine by experiment the effect of applying negative feedback to an amplifier in relation to the items listed in 2.4 above. • Determine by experiment the operation of: o R-C oscillator o L-C oscillator (Hartley o and coipitts)	Show with experiment that negative feedback results in gain reduction	Explain positive and negative feedback in amplifiers. and the general expression for stage gain of a basic feedback amplifier. Explain methods of employing frequency stability of oscillators.

	i. R- oscillator. ii. L-C oscillator (Hartley & colpitts) 2.7 Describe methods of employing frequency stability of oscillators e.g. piezo-electric crystal control etc.	the Colpitt's and Hartley oscillator circuits.				
General Objective 3: Apply the principles of switching circuits						
7-10	3.1 Explain the characteristics of switch. 3.2 Explain with aid of switches the principle of operation of the following multivibrators: i. Bistable. ii. Monostable iii. Astable.	• Draw and explain a simple electronic switch • Draw and explain the operation of the multivibrator circuits. • State the expression for determining the frequencies • Identify new trends in the switching circuits	Marker, White board, Recommended textbooks, Lecture Notes, Power supplies, transistors (BJT, or FET), bias resistors and capacitors), voltmeter, ammeter, Light bulbs, connecting cables.	• Demonstrate the operation of multivibrators o Astable o Monostable o Bistable • Measure the frequency of Astable multivibrator and compare with calculated values.	• Relate the theory with the experiments to be performed • Assign students into groups • Provide practical manuals and reporting guidelines to the students	Explain the principle of operation of multivibrators: .
General Objective 4: Know the action of basic electronic logics gates						
11-13	4.1 Explain the Boolean functions 4.2 Describe the truth tables 4.3 Explain the basic operation of the following electronic logic gates using appropriate symbols and truth tables: i. The 'NOT' gate or inventers; ii. The 'AND' gate; iii. The 'OR' gate;	• Define logic gates. • Draw and explain the operation of basic logic gates • Show the states of the gates by means of truth table • Use software packages to show the logic gates functions and	Marker, White board, Recommended textbooks, Lecture Notes, Power supplies, multimeters, connecting cables. Logic tutor, digital system trainer,	• Perform logic gate operations using: i. The 'NOT' gate or inventers; ii. The 'AND' gate; iii. The 'OR' gate; iv. The 'AND' gate ii. The 'NOR' gate	• Ensure students activities are recorded in standard laboratory notebook • Assess the students practical works and add appropriate comments	Explain the basic operation of the The 'NOT' gate or inventers; ii. The 'AND' gate;

	iv. The 'AND' gate i. The 'NOR' gate 4.4 Describe how to configure logic gates 4.5 Highlight the applications of logic gates	different ways they can be configured	logic pulser, logic probe.			iii. The 'OR' gate; iv. The 'AND' gate The 'NOR' gate
General Objective 5: Understand the basic circuits used in power supplies						
	5.1 Explain with sketches half-wave and full-wave rectification and calculate ripple factors. 5.2 Describe with diagrams the operation of a bridge rectifier. 5.3 Explain the use of the following as smoothing circuits: i. The capacitor input filter. ii. The inductance input filter. 5.4 Explain the action of a stabilized power supply using: iv. Zener diode. v. Series regulator.	• Draw a simple power supply and explain its operation • Explain half wave and full wave rectification. • Compare capacitive and inductive input filters • State the need for power supply regulation.	Marker, White board, Recommended textbooks, Lecture Notes. Power supplies, Oscilloscope, capacitors, diodes, transformers, function generator, voltmeter, ammeter, connecting cables.	• Verify the half wave and full wave outputs on the oscilloscope • Verify the effect of filter capacitor on the rectifier output.	• Explain the procedures to be followed to the students • Identify the set of equipment to be used for each experiment • Relate the theory with the experiments to be performed • Assign students into groups • Provide practical manuals and reporting guidelines to the students	Explain the use capacitor input filter and the inductance input filter.

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING	CODE: EEC 239	CREDIT HRS: 30 HRS
COURSE: ELECTRICAL CIRCUIT THEORY I	COURSES UNIT 2.0	
Goal: This course is designed to provide students with basic knowledge in electric circuit analyses.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand the Kirchhoff's laws and their application in solving d.c electrical problems. 2. Understand a.c theory and apply it to the solution of simple electrical circuit. 3. Understand Mesh and Nodal analyses and their applications in solving electrical problems. 4. Understand Network transformation and Duality principles. 5. Understand Network theorems and their applications d.c and a.c circuits.		

Theoretical Content				Practical Content		
General Objectives 1: Understand the Kirchhoff's laws and their application in solving D.C electrical problems						
	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1	1.1 Explain Kirchhoff's voltage and current laws. 1.2 Derive formulae for series and parallel circuit with respect to total current and voltage drop. 1.3 Solve problems on Kirchhoff's laws.	Revise Kirccoff's laws and derivation of its formulae with solving problems on them.	Whiteboard; Marker; Overhead Projector; Recommended Books;			State Kirchhoff's voltage and current laws. Derive formulae for series and parallel circuit with respect to total current and voltage drop.
General Objective 2: Understand A.C. theory and apply it to the solution of simple electrical circuits						
2 - 5	2.1State different mathematical forms of representing a.c. signal e.g. trigonometry polar and j-notation. 2.2 Convert a.c. signal in polar form to the j-notation. 2.3 Subtract, add, multiply and divide phasor using j-operator. 2.4 Solve simple problems using j-notation. 2.5 Draw to scale phasor diagrams for a.c. circuits. 2.6 Show with the aid of phasor diagrams that the current in a capacitor circuit leads the voltage and the current in the inductive circuit lags the voltage. 2.7 Distinguish between	• Explain the a.c theory with respect to serial and parallel circuit • Solve many problems involving a.c theory and circuits	Whiteboard; Marker; Overhead Projector; Recommended Books;			Solve some simple Mathematical Problem using using j-notation. Explain with the aid of phasor diagrams that the current in a capacitor circuit leads the voltage and the current in the inductive circuit lags the voltage. Differentiate between

	inductive and capacitive reactance. 2.8 Draw voltage and current wave forms on same axis to show lagging and leading angles. 2.9 Draw the phasor diagrams for series and parallel a.c. circuits. 2.10 Calculate voltage, current power and power factor in series and parallel circuits. 2.11 Explain series and parallel resource. 2.12 State conditions for series and parallel resource. 2.13 Prove the relevant formulae for 2.12 above e.g. q-factor, dynamic impedance, bandwidth, resonance frequency. 2.14 Sketch I and Z against F for series and parallel circuits where I=current, Z= impedance, F= frequency. 2.15 Calculate the Q-factor for a coil; loss factor for a capacitor. 2.16 Explain, with the aid of a diagram, bandwidth. 2.17 Solve problems involving bandwidth and circuit Q-factor					inductive and capacitive reactance.
General Objective 3: Understand Mesh and Nodal analyses and their applications in solving electrical problems						
6 –8	3.1 Explain the following terms used in electric	• Analyze nodal/mesh network circuits	Whiteboard; Marker;			Explain the basic

	network: i. Active element/circuit e.g. battery/circuit containing a battery etc. ii. Passive Element/circuit e.g. resistor/a source less circuit. iii. Branch. i. Node. ii. Loop; iii. Network. 3.2 Explain the basic principle of mesh circuit analysis. 3.3 Solve problem on items listed in 3.2 above. 3.4 Explain the basic principle of Nodal analysis. 3.5 Solve problem on 3.4 above.	• Solve nodal/mesh network circuits	Overhead Projector; Recommended Books;			principle of melh circuit analysis. And the basic principle of Nodal analysis.
General Objective 4: Understand Network transformation and duality principles						
9 -11	4.1 Reduce a complex network to its series or parallel equivalent. 4.2 Identify star and delta networks. 4.3 Derive the formula for transformation of a delta to a star network and vice-versa. 4.4 Solve problems on 4.3 above. 4.5 Explain the meaning of Duality principle. 4.6 Prove duality between	• Solve network problems with duality principle	Whiteboard; Marker; Overhead Projector; Recommended Books;			Explain the process to derive the formula for transformation of a delta to a star network and vice-versa

	resistance, conductance, inductance, capacitance, voltage-current. 4.7 Find the dual of network. 4.8 Solve network problems using duality principle					
General Objective 5: Understand Network theorems and their applications D.C. and A.C circuits						
12 -- 15	5.1 State Thevenin's Theorem. 5.2 Explain the basic principle of Thevenin's theorem. 5.3 Solve problems on simple networks using Thevenin's theorem. 5.4 Solve problems involving repeated use of Thevenin's theorem. 5.5 State Norton's Theorem. 5.6 Explain the basic principle of Norton's Theorem. 5.7 Compare Norton's theorem with Thevenin's theorem. 5.8 Solve problem using Norton's theorem. 5.9 State Millman's theorem. 5.10 Explain the basic principle of Millman's theorem. 5.11 Solve network problems using Millman's theorem. 5.12 State reciprocity theorem.	• Explain the Thevenin's and Norton's theorem to solve electric circuits/networks problems • Solve network problems using Millman's theorem and Reciprocity theorem	Whiteboard; Marker; Overhead Projector; Recommended Books;			State Thevenin's Theorem and explain the basic principle of Thevenin's theorem

	5.13 Explain the basic principle of reciprocity theorem. 5.14 Solve network problems using Reciprocity theorem					

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 1 progress test for feedback.	20
Course work/ assignment	To be assessed by the teacher	20
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 231	CREDIT HRS: 45 HRS
COURSE: MICROCOMPUTER FUNDAMENTALS	COURSES UNIT 3.0	
Goal: This course is intended to provide students with the knowledge of Microcomputer Fundamentals		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1.0 Know the processor and the component parts. 2.0 Understand memory and storage devices of computers. 3.0 Know the operations of input devices in computer system. 4.0 Know the operations of output devices in computer system. 5.0 Understand concepts and function of power supply in computer system. 6.0 Understand the serial and parallel communication and devices in computer. 7.0 Understand the multi-user environment. 8.0 Know the different types of modems and their uses.		

Theoretical Content			**Practical Content**			
GENERAL OBJECTIVE 1: Know the processor and the component parts.						
Week	**Specific Learning Outcomes**	**Teacher's Activities**	**Learning Resources**	**Specific Learning Outcomes**	**Teacher's Activities**	**Evaluation**
1-2	1.1 Distinguish CPU Chips by their basic characteristics. 1.2 Explain the anatomy of the microprocessor (basic parts of microprocessor). 1.3 State the distinct bus structure of microprocessor. 1.4 Explain the CPU packaging and heatsink. 1.5 Describe the general types of mounting used to mount processor to the motherboard (slots and sockets).	Explain the microprocessor. Explain the central processing unit (CPU). Draw a block diagram of a typical microprocessor and explain the function of each component part	Computers, online resources, technician tool boxes, textbooks, laboratory manuals, whiteboard, cables, computer components/parts	Perform replacement of motherboards Perform replacement of microprocessors on motherboard	Explain the need to wear electrostatic discharge band or use the ESD mat when working with computers Identify popular microprocessors List different companies producing processors and the brand they produce Provide data sheets of microprocessors	
GENERAL OBJECTIVE 2: Understand memory and storage devices of computers.						
3-4	2.1 Identify the location and physical characteristics of memory.	Explain various blocks for making up the computer	Computers, online resources, technician tool boxes,	Install memory modules in computers	Describe the fundamental concept of	

	2.2 Describe the basic levels of memory: RAM and and ROM. 2.3 Explain the procedure to install memory modules 2.4 Define memory management. 2.5 Explain real and virtual memory. 2.6 Describe parity and non-parity memory. 2.7 Explain the concepts and functions of storage systems. 2.8 List the types of hard drive technologies 2.9 Explain installation and configuration of hard drives. 2.10 Explain tape medias and tape drives used in computers. 2.11 Describe floppy disks and drives, CD-ROM, DVD technologies and drives. 2.12 Explain the components of SCSI technologies.	Describe the following input/output (I/O) devices monitor, printer, keyboards etc) Explain storage devices and memories in computer Describe the motherboard Explain the power supplies: internal and external-UPS, AVR	textbooks, laboratory manuals, whiteboard, cables, computer components/parts	Perform installation and configuration of floppy disk drives, optical drives, Perform installation and configuration of hard drives Perform installation and configuration of SCSI devices	redundant array of independent disks (RAID) Describe primary file systems in Windows OS Describe partitioning of hard drive and its importance Explain the basic divisions in a logical memory layout and how to divide memory into logical divisions	
GENERAL OBJECTIVE 3: Know the operations of input devices in computer system.						
5-6	3.1 Explain the roles of keyboards in computer systems. 3.2 State the categories of keyboard styles	Describe the various forms of pointing devices (mouse, the track ball, lighten etc.)	Computers, online resources, technician tool boxes, textbooks, laboratory manuals,	Connect wired and wireless keyboards to computers		

	3.3 Explain how keyboard works and its key mechanisms. 3.4 Explain interaction of keyboard drivers with the computers. 3.5 Explain internal parts and operation of the mouse. 3.6 Explain concepts of mechanical and optical mouse. 3.7 Explain the mode of operations of joysticks, touch pats and digitizing tablets. 3.8 Describe types of devices to capture images into the computers such as scanners, camera etc. 3.9 Explain the sound card with connection ports for microphones and speakers.	Explain simple maintenance on the pointing devices.	whiteboard, cables, computer components/parts	Perform safe keyboarding Connect mouse to computers		
	GENERAL OBJECTIVE 4: Know the operations of output devices in computer system.					
7-8	4.1 Explain common output devices such as monitors, printers and sound systems. 4.2 Describe types of monitors such as cathode ray tube, liquid crystal display etc 4.3 Explain the function	Explain the operation and functions of the following: I.O devices, C.P.U, Storage devices, Controls, and Power supplies i.e. internal and external AVR & UPS	Computers, online resources, technician tool boxes, textbooks, laboratory manuals, whiteboard, cables, computer components/parts	Set the display resolution, aspect ratio, refresh rate and colour rate of monitors Install sound cards in the expansion card slots on the	Provide common output devices such as monitors, printers and sound systems Configure	

	of video adapter card in computers as well as graphic processing unit (GPU). 4.4 Describe the popular video system interfaces used in computers. 4.5 Describe the different connectors for monitors. 4.6 Describe display power management system and green standard compliance in computers. 4.7 Explain the sound cards standards 4.8 List the components of a sound system in computers e.g sound cards, speakers, amplifiers. 4.9 State varieties of audio file types stored and played on a PC suchas WAV, WMA, MP3, MP4			motherboard	display power management system and green standard compliance in computers	
	GENERAL OBJECTIVE 5: Understand concepts and function of power supply in computer system.					
9-10	5.1 State the components of computer power supply such as: Power cord, connectors, power	Explain the preparation and handling of storage devices. Explain the importance of control unit.	Computers, online resources, technician tool boxes, textbooks, laboratory manuals,	Install surge protector, UPS and line conditioner for computers	State safety procedures to be followed in computer power supplies	

	switch, selector switch (100V/220V) 5.2 Explain the concepts and functions of PC. power supply systems 5.3 Identify safety procedures in computer power supplies. 5.4 Explain how to detect common problems in power supplies. 5.5 State the following power issues in computers: line noise, power surges. brownouts, blackouts. 5.6 Describe the damages that can be done to computer by electrical forces 5.7 Explain the functions of surge suppressor, line conditioners, uninterruptible power supply (UPS). 5.8 Describe power conversion from AC to DC. 5.9 Explain the standard levels of voltages that are used by motherboards and drives of computers		whiteboard, cables, computer components/parts		Identify methods to detect common problems in power supplies	
GENERAL OBJECTIVE 6: Understand the serial and parallel communication and devices in computer.						

11-12	6.1 Explain serial and parallel communication 6.2 Explain serial devices, cables, connectors ports in computers 6.3 State examples of serial devices 6.4 Explain the data terminal equipment (DTE) and data communication equipment in serial communication 6.5 State parallel ports and their uses 6.6 Explain high-speed serial connections such as universal serial bus (USB) and FireWire etc 6.7 Explain wireless ports in computers.	Draw the linkages between the various blocks of a computer. Explain the sequence of transmission of information between the various blocks. Describe the various parts connection (serial, parallel) Explain various general interface and the principles of I/O interface. Explain various interfacing techniques.	Computers, online resources, technician tool boxes, textbooks, laboratory manuals, whiteboard, cables, computer components/parts	Perform connection and disconnection of serial cables, USB and FireWire cables	Set up serial and parallel ports	
	GENERAL OBJECTIVE 7: Understand the multi-user environment.					
13-14	7.1 Describe computer. network and its types 7.2 Explain topology of computer networks 7.3 Explain internet domains in networking. 7.4 Describe server and its common types. 7.5 List the characteristics of common types of	Connect simple multi-user systems without repeater stations.	Computers, online resources, technician tool boxes, textbooks, laboratory manuals, whiteboard, cables, computer components/parts, computer networks	Perform installation and configuration of NIC Connect a workstation to a computer network	Provide common types of cables, NICs and workstations	

	cables used in networking. 7.6 Explain network interface cards (network adapters) in computers. 7.7 Identify the characteristics of network adapters. 7.8 Explain the common network protocols that are required to interconnect computer to other computers or networks. 7.9 Explain networking monitoring and diagnostic tools					
GENERAL OBJECTIVE 8: Know the different types of modems and their uses.						
15	8.1 Define a modulator/demodulator (modem) 8.2 Explain general types of modems and their functions. 8.3 Explain dial-up networking. 8.4 Explain point to point connections. 8.5 State the most popular browsers. 8.6 Explain the process of connecting a computer to Internet 8.7 Explain how dial up and	Identify the various modems with transmission speeds without repeaters.	Computers, online resources, technician tool boxes, textbooks, laboratory manuals, whiteboard, cables, computer components/parts, modem, Internet connectivity	Connect a modem to a computer Perform installation and configuration of a browser	Use different types of modems Describe Internet connectivity using dial up and network connections	

	network connections can be used to connect to Internet. 8.8 Explain the concept of Internet Connection sharing to share a single internet connection.					

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 232	CREDIT HRS: 45 HRS
COURSE: COMPUTER WORKSHOP PRACTICE I	COURSE UNIT : 3	
Goal: The course is designed to enable students have the knowledge of the various components, assembling and installation of the computer system.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Know the various components of the computer system. 2. Understand how to perform computer installation using manuals. 3. Know preventive and maintenance of computer system 4. Know the how to assemble and install a computer system		

	Theoretical Content			Practical Content		
General Objective 1: Know the various components of the computer system						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1 - 4	1.1 Explain the system unit, monitor, mouse, scanner, printer, plotter etc. 1.2 Explain the various components of the system unit such as: ✓ Motherboards ✓ CPU ✓ CPU overdrive ✓ Controller card ✓ VGA card ✓ Expansion slots (8,16,32,64 bits) 1.3 Describe the hard disk types EIDE, IDE, SCSI etc. 1.4 State the memory types on the board/card: Cache, VRAM, SRAM, DRAM etc. 1.5 Describe the floppy disk drives $3^{1/2}$ / $5^{1/4}$ disk drives.	Show the students hard disk drive types. EIDE, IDE, SCSI, etc. Show the student the types of computer memory on the board/card. Show the students types of floppy drives.	System unit Lab coat White board Marker	Identify the system unit, monitor, mouse, scanner, printer, plotter etc. Identify the various components of the system unit such as: ✓ Motherboards ✓ CPU ✓ CPU overdrive ✓ Controller card ✓ VGA card ✓ Expansion slots (8,16,32,64 bits) Identify the hard disk types EIDE, IDE, SCSI etc. Identify the memory types on the board/card: Cache, VRAM, SRAM, DRAM etc.		identify system unit and other I/O devices
General Objective 2: Understand how to perform computer installation using manuals.						
5-8	2.1 Interpret the installation/maintenance manuals.	Introduce the students to installation and	White board Marker Textbooks	Carry out RAM upgrade. Carry out the pre-	Guide students in the demonstrate simple computer	Carry-out simple installation and maintenance of the

	2.2 Explain the procedures to carry out RAM upgrade. 2.3 Explain site preparation method. 2.4 Explain the need for equipment inventory. 2.5 Describe how to carry out the pre-installation checks of a computer i.e. electrical, mechanical, humidity etc. 2.6 Explain simple computer installation.	maintenance of computer system. Introduce the students to installation and maintenance of computer system	UPS AVR Good and bad computer systems. Good and open circuited power cords Practical manuals/guide Computer components and accessories	installation checks of a computer i.e. electrical, mechanical, humidity etc. Carry out simple computer installation.	installation	computer.
General Objective 3: Know preventive maintenance						
9-11	3.1 Explain the importance of preventive maintenance of hardware. 3.2 Describe routine cleaning and defragmentization of disk drives, motherboards etc. 3.3 Explain prevention procedures e.g. routine checks. 3.4 Explain the application of dust prevention procedures for	Explain the importance of maintenance of hardware.	White board Marker Textbooks UPS AVR Good and bad computer system. Good and open circuited power cords Practical manuals/guide	3.2 Carry out routine cleaning and demagnetization of disk drives, motherboards etc. Demonstrate prevention procedures e.g. routine checks. Apply dust prevention procedure for Computer systems, Carpets etc. Demonstrate routine cleaning and	Guide to demonstrate routine cleaning and demagnetization of disk drives, motherboards, etc.	Maintenance tools, such as screwdriver, brush, methylated spirit, etc.

	Computer systems, Carpets etc. 3.5 Explain how to make system disks with utilities.			defragmentization of disk drives, motherboards, etc.		
General Objective 4: Know the how to assemble and install a computer system						
12-15	4.1 Explain how to assemble a computer system. 4.2 State installation procedures of a computer system. 4.3 Explain how to configure of a computer system.	Explain the process of assembling a computer system. Installation of a computer system and Configuration of a computer system	Hardware components, such as drives, motherboards, etc Monitor	Assemble a computer system. Install a computer system. Configure of a computer system	Guide students in the: Assembling of a computer system. Installation of a computer system. Configuration of a computer system	Assemble, install and configure computer systems.

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and skills	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Total		100

COURSE: DIGITAL COMPUTER FUNDAMENTAL II	COURSES UNIT 3.0	
Semester 3		
Goal: This course is intended to provide students with the knowledge of the principles of bistable or flip-flop in the operations and applications of logic devices.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand the features of different logic gates and the sequence and data flow controls 2. Understand basic principle of bistable elements and the principle of counter and register 3. Know the implementation of the addition operation in the computer and digital circuit components. 4. Understand the characteristic of basic digital devices and the design and construction of simple combinational logic circuits using the basic devices. 5. Understand the operation of bistable elements and simple sequential circuit.		

Programme: National Diploma in Computer Engineering Technology			Course code: CTE 233		Contact Hours:45
Course: DIGITAL COMPUTER FUNDAMENTAL II					Theoretical: 1
Year: Two	Semester: Three		Pre-requisite: Digital Computer Fundamental I		Practical: 2
General Objective 1: Understand the features of different logic gates and the sequence and data flow controls					
	Theoretical Content			Practical Content		
Week	Specific Learning Objectives	Teacher's activities	Resources	Specific Learning Objectives	Teacher's activities	Evaluation
1-4	1.1 Explain the principle of operation of combinational logic. 1.2 Write down a logical sum of product equations. 1.3 Draw circuit diagram that implements the equation above using: AND, OR, NOT gates. i) NAND ii) NOR iii) Exclusive-OR iv) Exclusive-NOR functions. 1.4 Design logic circuits using a combination of logic gates. 1.5 Describe the action of the diode. 1.6 Describe the construction of the AND, or OR gates using diode.	Explain a logical sum of product equations. Use AND,OR,NOT gates.i) NAND ii) NOR iii) Exclusive-OR iv) Exclusive-NOR logic gates to design combinational logic functions.	PC Loaded with Instructional manual Power point package and connected to an OHP and Internet, whiteboard, textbooks, Computer Technology laboratory	Demonstrate operations of gates using truth-table.	Illustrate the action of gates using truth-table.	Explain the principle of operation of combinational logic. Design logic circuits using a combination of logic gates

General Objective 2: Understand basic principle of bistable elements and the principle of counter and register						
5-8	2.1 Define a bistable (flip flop). 2.2 Describe the action of a flip flop. 2.3 Describe the operation of the following bistables elements: i) RS Flip-flop ii) Clocked RS flip-flop iii) D-flip-flop,T-flip-flop(toggle flip-flop),JK-flip-flop. 2.4 Explain the function of preset and clear of the bistable element. 2.5 Describe some specific I.C bistable elements e.g i) SN 7474 ii) SN 7476. 2.6 Describe the operation of the basic binary ripple counter. 2.7 Describe the operation of up and down counters. 2.8 Describe the operation of the modules counter using as example Mod-10, Mod-12,	• Give the general format of Flip-flop. • Identify different types of bistable elements. •Explain the operation of different modules e.g mod-6,mod10 and mod-12. Explain the operation of the basic binary ripple counter and the up and down counters, Explain a shift-left, a shift-right and shift round registers. and the parallel transfer of data through registers. .	PC Loaded with Instructional manual Power point package and connected to an OHP and Internet	Perform operation of register and counters. Perform the operation of the following bistables elements: i) RS Flip-flop ii) Clocked RS flip-flop iii) D-flip-flop,T-flip-flop(toggle flip-flop),JK-flip-flop.	Assist student to identify different families of flip-flop, ICs families and Observe the operation of the following bistables elements: i) RS Flip-flop ii) Clocked RS flip-flop iii) D-flip-flop,T-flip-flop(toggle flip-flop),JK-flip-flop.	Explain the operation of the following bistables elements: i) RS Flip-flop ii) Clocked RS flip-flop iii) D-flip-flop,T-flip-flop(toggle flip-flop),JK-flip-flop.

	and Mod-6 counters. 2.9 Define a shift-left, a shift-right and shift round registers. 2.10 Describe the parallel transfer of data through registers. 2.11 Describe the serial-parallel transfer operation.					
General Objective 3: Know the implementation of the addition operation in the computer and logical circuit components						
9-11	3.1 Describe the serial adder. 3.2 Describe the parallel adder. 3.3 Describe the half-adder. 3.4 Describe the full-adder. 3.5 Describe different logic elements. 3.6 Identify AND,OR,NOT,NAND and XOR gates.	• -Illustrate events driven by counters and registers with examples. • -Ask students to draw the examples of adders. • -Give programming exercise on event driven programs.	PC Loaded with Instructional manual Power point package and connected to an OHP and Internet, whiteboard, textbooks, Computer Technology laboratory	Connect simple logic circuits. Perform the following addition operations using logic gates: Serial adder, parallel adder, halfer adder and full adder	Guide students to connect to a simple java event driven program	Explain the serial adder, the parallel adder, the half-adder And the full-adder. Explain different logic element Identify AND,OR,NOT, NAND and XOR gates
General Objective 4: Understand the characteristic of basic digital devices and the design and construction of simple combinational logic circuits using the basic devices.						
12-13	4.1 Describe the operation of different logic	• Show the students different types of logic	PC Loaded with Instructional manual	Demonstrate the operation of combinational of logic	Guide students to demonstrate the	Describe the operation of

	elements e.g AND, OR, NOT, NOR, NAND, and XOR gates. 4.2 Analyse the circuit diagram that implement various circuit combinations.	gates. • Draw their circuit diagrams • Give assignment to cover topics. • Arrange for Questions and Answer sessions.	Power point package and connected to an OHP and Internet, whiteboard, textbooks, Computer Technology laboratory	function. Demonstrate practically the logic AND,OR,NOT using i) Logic gates ii) Discrete elements.	operation of combinational of logic function.	different logic elements.
General Objective 5: Understand the operation of bi-stable elements and simple sequential circuit						
14-15	5.1 Draw some specific IC bistable elements e.g SN 7474, SN 7476 etc 5.2 Explain the construction of sequential circuits using bi-stable ICs. 5.3 Analyse the design techniques of sequential circuits.	• Show the students different types of ICs. • Show them SN 7474 series and 7476 series of ICs. • Assignment to cover topics. • Questions and Answer sessions.	PC Loaded with Instructional manual Power point package and connected to an OHP and Internet, whiteboard, textbooks, Computer Technology laboratory	Perform experiments to illustrate sequential circuit (counters,registers) using the various bistable elements Draw some specific IC bistable elements e.g SN 7474, SN 7476. Construct sequential circuits using bi-stable ICs.	• Show the students different types of ICs. • Show them SN 7474 series and 7476 series of ICs. •Assignment to cover topics. • Questions and Answer sessions -	Explain the design techniques of sequential circuits.

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 234	CREDIT HRS: 45 HRS (1/0/2/WEEK)
COURSE: COMPUTER ARCHITECTURE I	UNIT: 3.0	
GOAL: This course is intended to provide students with basic knowledge and skills of the structural and functional characteristics of various components of computer system.		
GENERAL OBJECTIVES: On completion of this course, student should be able to: 1.0 Know the basic concept of computer architecture 2.0 Understand concept of memory organization of computer system 3.0 Appreciate the conventional 8/16/32/64 -bit computer architecture 4.0 Know the addressing modes 5.0 Know interrupts and their various types		

Programme: National Diploma in Computer Engineering Technology				Course code: CTE 234		Contact hr.45Hrs
Course: COMPUTER ARCHITECTURE I						
Year : Two		Pre-requisite		Theoretical 1		
Semester 3		Practical 2				
Goal:						
Theoretical Content				Practical Content		
General Objective 1: Know the basic concept of computer architecture						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-3	1.1 Describe the various word formats. 1.2 Explain the concept of Von Neumman's structure. 1.3 Explain various units and registers of a typical CPU. 1.4 Explain the various. methods of addressing software and hardware components.	Explain the various word formats Explain in details Von-Neumman's architecture and futures. Explain in details item 1.3 to1.4	Lecture note, White board, Power Point Presentation	Identify various units and registers of a typical CPU		Explain the various methods of addressing software and hardware components
General Objective 2: Understand concept of memory organization of computer system						
4-6	2.1 Explain microcomputer control Bus, Address Bus and Data Bus. 2.2 Explain the use of memory management and mention techniques commonly used. 2.3 Explain the concept of cache memory.	Explain data, control and address buses. Explain what is memory management and its techniques	Lecture note, White board, Power Point Presentation	Identify control bus, address bus and Data bus of microcomputers		Explain the use of memory management and mention techniques commonly used
General Objective 3: Appreciate the conventional 8/16/32/64 -bit computer architecture						
7-9	3.1 Explain conventional 8/16/32/64- bit computer architecture. 3.2 Define the concept of pipeline instruction sets,	Explain and demonstrate the concept of inner and outer buses as well as downgraded	Lecture note, White board, Power Point Presentation	Identify 32-bit and 64-bit processors		

	reduced instruction. 3.3 List microprocessor CPU of 8/16/32/64- bit architecture.	version of computer architecture. Explain some computer instruction sets. Explain various types of microprocessors and its block diagram presentation.				
General Objective 4: Know the addressing modes						
10-12	4.1 Explain instruction components opcode and operand. 4.2 Explain operand types- Register, Memory, and immediate. 4.3 Describe instruction fetch and execute. 4.4 Explain addressing modes- Direct, indirect, immediate and indexing.	Explain in details components of 4.1 to 4.4. Demonstrate their types using power point presentation.	Lecture note, White board, Power Point Presentation, single board computers (Arduino, Raspberry Pi, etc)	Write instructions sets to perform basic operations and store the results in registers		Explain instruction components opcode and operand. Register, Memory, and immediate. Instruction Fetch and Execute.
General Objective 5: Know interrupts and their various types						
13-15	5.1 Define interrupt 5.2 Enumerate types of interrupt. 5.3 Explain branching techniques.	Explain in details various types of interrupt. Explain the branching techniques, direct and indirect.	Lecture note, White board, Power Point Presentation	Write interrupt handler functions		Enumerate types of interrupt.

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)

Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 235	CREDIT HRS: 45 HRS
COURSE: ELECTRICAL MEASUREMENT & INSTRUMENTATION II	COURSES UNIT 3.0	
Goal: This course is intended to enable students select, connect and use electronic/electrical instruments for measurement of physical quantities.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Use of different types of meters for measuring power and power factor. 2. Use of different types of bridges (a.c. and d.c.). 3. Understand the principle of operation of a fluxmeter and its application. 4. Understand the principle and use of digital instruments. 5. Know the various factors which should be considered when selecting an instrument. 6. Understand the main types of measurements and measuring instruments.		

Theoretical Content	Practical Content
General Objective 1: Use of different types of meters for measuring power and power factor	

Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1– 3	1.1 Explain the electrodynamics principles of different types of power measurement. 1.2 Describe the operation of electrodynamics wattmeter and power factor meter. 1.3 Explain the induction principle of power measurement. 1.4 Describe the induction wattmeter. 1.5 Describe the use of two wattmeter for power measurement in a 3 phase circuit. 1.6 Explain measurement of power in: - Single phase circuit; - 3 phase circuit, using wattmeter and p.f. meters	- Explain the circuit structure of wattmeter and power factor meter Explain the circuit for power measurement using wattmeter and power factor meter	Chalk, Board, recommended textbook,. Power supplies, Wattmeter and power factor meter	Use wattmeter to measure power in ac and dc circuits.	- Demonstrate the use of wattmeter for power measurement in single phase circuit. - Demonstrate the use of two wattmeters for power measurement in 3-phase circuits	Describe the induction wattmeter and the induction principle of power measurement.
General Objective 2: Use of different types of bridges (A.C and D.C)						
4 – 6	2.1 Explain the term null indicator. 2.2 Describe the expression for the measurement of an unknown resistance	- Explain the types and uses of various electrical bridge;	Chalk, Board, recommended textbook. Power supplies,	Practice the use of bridges for accurate measurements	- Demonstrate the use of dc and ac bridges to measure - resistance - capacitance - inductance	Measure circuit parameters using electrical bridges. Explain the structure of ac bridges,

	by Wheatstone bridge circuit. 2.3 Derive the expression for the measurement of an unknown resistance by Wheatstone bridge circuit. 2.4 Describe the Carey Foster's slide wire bridge. 2.5 Explain the structure of the following ac bridges: i. Wien bridge ii. Maxwell's bridge iii. Schering bridge iv. Hay bridges bridge 2.6 Derive expressions for the measurement of unknown capacitance or inductance using the bridges in 2.5 above. 2.7 Explain, how a.c. bridge can be used to measure; i. Resistance; ii. Inductance; iii. Capacitance; iv. Frequency 2.8 Measure the items listed in 2.5 above.		Wattmeter and power factor meter		- frequency - Give the students experiments to measure the above basic circuit parameters	Wien bridge Maxwell's bridge, Schering bridge Hay bridges bridge. Explain, how a.c. bridge can be used to measure; i. Resistance; ii. Inductance; i. Capacitance; iv. Frequency
General Objective 3: Understand the principle of operation of a fluxmeter and its application						

7 – 8	3.1 Describe the constructional features of a fluxmeter. 3.2 Explain the principle of operation of a fluxmeter. 3.3 Explain the use of a fluxmeter for drawing B H curves.	Explain the importance of B-H curves for magnetic materials	Chalk, Board, recommended textbook.	Determine by experiments the B.H curves for different magnetic materials using a flux meter.	- Draw the B-H curves for magnetic materials using values measured with flux meter	Explain the principle of operation of a fluxmeter
General Objective 4: Understand the principle and use of digital instruments						
9 – 10	4.1 Explain with aid of block diagram the working principles of a digital voltmeter and ammeter. 4.2 Explain how the DVM can be used to measure: a. Voltage; b. Current; c. Resistance. 4.3 State the limitations of the DVM for measuring high frequency signals. 4.4 Explain with aid of a block diagram, the working principle of a digital frequency meter. 4.5 State advantages of digital meters over other electromechanical measuring	- Give the essential features of digital instruments. - Emphasize the advantages and limitations of digital instruments compared to analogue instruments Explain the advantages of digital meters and electromechanical measuring instruments	Chalk, Chalkboard, Notes, recommended textbook.	Demonstrate how to measure voltage, current using digital instruments	Guide students to Demonstrate how to measure voltage, current using digital instruments	Use measuring instrument to measure voltage, current, frequency and resistance. Explain with aid of a block diagram, the working principle of a digital frequency meter.

	instruments. 4.6 Explain how to measure voltage, current and frequency using digital instruments.					
General Objective 5: Know the various factors which should be considered when selecting an instrument						
11– 12	5.1 Explain the importance of the factors using the following factors in selecting instruments for measurement i. Range. ii. Accuracy. iii. Response. iv. Input. v. Stability. vi. Operation. vii. Reliability. viii. Sensitivity. 5.2 Define the factors listed in 5.1 above	Explain the effect of various instruments parameters on the measurand	Chalk, Chalkboard, Notes, recommended textbook.			Explain the i. Range. ii. Accuracy. iii. Response. iv. Input. v. Stability. vi. Operation. vii. Reliability iii. Sensitivity
General Objective 6: Understand the main types of measurements and measuring instruments						
13-15	6.1 Explain instrumentation and its importance. 6.2 Explain the working principles and uses of the following instruments: a. Indicating	Explain instrument classifications. Explain the working principles and uses of measuring instruments	Chalk, Chalkboard, Notes, recommended textbook.	Calibrate each type of the instrument: a. Indicating instrument; b. Recording instrument; c. Controlling instrument		

	instrument; b. Recording instrument; c. Controlling instruments 6.3 Differentiate the instruments stated in 6.2 above, giving example of each.					

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 236	CREDIT HRS: 30 HRS
COURSE: INTRODUCTION TO VISUAL BASIC PROGRAMMING LANGUAGE	COURSES UNIT 2.0	
Goal: This course is designed to enable students acquire the basic knowledge on scientific programming.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand integrated development environment. 2. Understand the visual basic programming concept 3. Know control statement in OOP. 4. Know the usage of procedure and functions. 5. Understand the use of Arrays and structures. 6. Understand how to create classes and functions. 7. Understand how to create classes and objects. 8. Know how to create and manipulate data files. 9. Understand dialogue box concepts		

Programme: National Diploma in Computer Engineering Technology			**Course code: CTE 236**			**Contact Hours:45**
Course: Introduction to Visual Basic Programming Language						**Theoretical:** 1
Semester: Three			**Pre-requisite:**			**Practical:** 2
General Objective 1: Understand the integrated Development Environment.						
Week	**Theoretical Content**			**Practical Content**		
	Specific Learning Objectives	**Teacher's activities**	**Resources**	**Specific Learning Objectives**	**Teacher's activities**	**Resources**
1	1.1 Describe: the Integrated Development Environment (IDE). • Project window • Toolbox • Form layout window • Properties window • Menu and toolbars	Describe the Integrated Development Environment (IDE) Project Window Toolbox Form layout window Properties window Menu and toolbars	PC loaded with Visual BASIC, compiler and connected to OHP Power Point Presentation of lecture notes. Online lecture notes.	Identify IDE, Project window, Toolbox, Form layout, Properties window, Menu and toolbars.	Guide students to Identify IDE, Project Window, Toolbox, Form Layout, Properties window, Menu and toolbars	Networked PC's loaded with OOFORTR, and a compiler
General Objective 2: Understand the visual basic programming concept.						
2 - 3	2.1 Explain the following: i. Visual programming ii. Event-Driving programming. 2.2 Explain VB character set, Data types and Data type conversion 2.3 Explain various types of variables 2.4 List the rules for	Explain Visual programming Event-Driving Programming. VB character set Data types Data type conversion The various types of variables The rules for forming variable names. Declaration of variables	PC loaded with Visual BASIC, compiler and connected to OHP Power Point Presentation of lecture notes. Online lecture notes.	Identify VB character set Use data types and Variable names Write simple program to store and retrieve data	Guide students to identify VB character set. Demonstrate the use of data types and Variable names. Write simple program to store and retrieve data	Networked PC's loaded with OOFORTR, and a compiler

	forming variable names. 2.5 Explain declaration of variables. 2.6 Explain storing and retrieving data in a variable.	Storing and retrieving data in a variable.				
General Objective 3: Understand Statements, Operators, Expressions and object variables.						
4 - 5	3.1 Explain: Visual Basic Statements, Operators, Expressions, and Object variables 3.2 Explain object variable declaration. 3.3 Describe scope of variable. 3.4 Explain instances of an object.	Describe : Operators and their various types, Object data types, Object variable declaration Scope of variable Instances of an object	PC loaded with Visual BASIC, compiler and connected to OHP Power Point Presentation of lecture notes. Online lecture notes.	Use operators, object data types and scope of variables Write simple program.	Demonstrate how to use Operators Object data types Scope of variable Guide students on how to write simple program to implement the use of operators, object data type and scope of variable	Networked PC's loaded with OOFORTR, and a compiler
General Objective 4.0: Know control statements in OOP						
6-7	4.1 Describe conditional statements such as: IF ….ELSE, SWITCH, CASE, FOR.. NEXT, WHILE …DO, DO … WHILE, DO … UNTIL statements	Describe IF … THEN statement IF .. THEN .. ELSE statement SWITCH function CASE statement FOR.. NEXT statement WHILE … DO statement DO … WHILE statement DO … UNTIL statement	PC loaded with Visual BASIC, compiler and connected to OHP Power Point Presentation of lecture notes. Online lecture notes.	Write program using the various control statements.	Guide students on how to write program to implement the various control statements.	. Networked PC's loaded with OOFORTR, and a compiler

General Objective 5: Know the use of procedure and functions						
8	5.1 Explain the scope of variables such as public, private, global and static. 5.2 State the different types of constants e.g. system defined. 5.3 Describe the scope of constants. 5.4 Explain the concept of circular referencing. 5.5 Describe the concept of procedure. 5.6 Highlight user's defined functions 5.7 Explain how to define and call a function. 5.8 Explain how to define recursive procedures.	Describe the scope of variables such as public, private, global and static. The different types of constants e.g. system defined. The scope of constants. The concept of circular referencing. The concept of procedure. User's defined functions How to define and call a function. How to define recursive procedures.	PC loaded with Visual BASIC, compiler and connected to OHP Power Point Presentation of lecture notes. Online lecture notes.	Write program using the various variable declaration and .different types of constants. Implement functions Write recursive procedures	Guide students on how to write program to implement the various control statements.	Networked PC's loaded with OOFORTR, and a compiler
General Objective 6: Understand the use of Arrays and structures.						
9	6.4 Explain array declaration and subscript range. 6.5 Explain multiple array declaration. 6.6 Explain static, global and dynamic array declaration. 6.7 Explain static and dynamic allocations.	The teacher explain array and when they are required in a program. He should demonstrate the multiple arrays using a practical problem. He should illustrate and explain with example static and dynamic array declaration. The teacher should	PC loaded with Visual BASIC, compiler and connected to OHP Power Point Presentation of lecture notes. Online lecture notes.	Write programs, which uses any static, global and dynamic array.	Guide students on how to write program to implement the various array declaration.	Networked PC's loaded with OOFORTR, and a compiler

		give a practical test to use student.				
General Objective 7: Understand how to create classes and objects.						
10-11	7.1 Explain the constructors and destructors. 7.2 Explain information guiding using private, public and protected. 7.3 Explain instances of class variables. 7.4 Explain the creation of methods. 7.5 Demonstrate 7.1 – 7.4 above with a sample program.	The teacher should explain constructor and destructors and explain their role in the utilization of objects. He should explain the instances access and now it is done. Examples should be given by it. The teacher should explain methods and the procedure for creating it. The teacher should explain with a sample program.	PC loaded with Visual BASIC, compiler and connected to OHP Power Point Presentation of lecture notes. Online lecture notes.	Wwrite programs which uses constructor and destructor, and define instances of class variables?	Assist students on their practical work.	Networked PC's loaded with OOFORTR, and a compiler
General Objectives 8: Know how to create and Manipulate Data files.						
12-13	8.1 Describe the different types of Data files e.g. sequential, random, binary. 8.2 Explain how to create the file types. 8.3 Explain how to read and write to the file type mentioned above. 8.4 Demonstrate 8.1 – 8.3 above with a sample.	The teacher should explain data kills, the sissies and purpose of each type. The teacher should explain demonstrate how to create data file. The teacher should also explain and write program to demonstrate how to read and write a file. The teacher should explain and give procedural steps for creating, linking a database using codes,	PC loaded with Visual BASIC, compiler and connected to OHP Power Point Presentation of lecture notes. Online lecture notes.	Create files and operate on them.	To assist students in their practical work .	Networked PC's loaded with OOFORTR, and a compiler

		data control and data environment. The teacher should demonstrate and explain the importance of SQL in database access.				
General Objective 9: Understand dialogue box concepts						
14-15	9.1 State the different dialogue boxes available e.g. message box, input box file/open dialogue box file/save dialogue Box, File/print Dialogue Box e.t.c. 9.2 Write a program to demonstrate the use of 9.1 above.	The teacher should explain and demonstrate with example the available custom control and the use. The teacher should revise the course content. The teacher should complete revision.	PC loaded with Visual BASIC, compiler and connected to OHP Power Point Presentation of lecture notes. Online lecture notes.	Write dialogue boxes	Assist students in their practical work.	Networked PC's loaded with OOFORTR, and a compiler

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

ND II - FOURTH SEMESTER

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: EEC 249	CONTACT HRS: 30 HRS
COURSE: ELECTRICAL CIRCUIT THEORY II	COURSES UNIT 3.0	
Goal: This course is designed to enable students acquire further knowledge in electric and magnetic circuit analysis.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand the principles of power calculation in a.c. circuits. 2. Know simple integrated circuit (IC) and its ratings. 3. Understand time domain analysis of RC, RL and RLC circuits. 4. Understand the magnetic coupling phenomena.		

Theoretical Content						
General Objective 1: Understand the principles of power calculation in A.C. circuits						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1 – 3	1.1 Calculate power in A.C. circuits containing: a. Resistance; b. Inductance; c. Capacitance; d. Combinations of (i.) - (iii) 1.2 Explain power factor and factors affecting its value 1.3 Explain the following: a. Apparent power; b. Reactive power; c. Active power. 1.4 Explain methods of power factor correction 1.5 Solve problems on power factor, active power, apparent power, reactive power and power factor correction.	Show how to calculate a. Power from a.c. circuit b. Explain various ways to get a.c. parameters. c. Describe the use of 3-phase a.c. power. d. Show how to calculate various parameters in frequency domain. e. Explain coupling.	Whiteboard; Marker; Overhead Projector; Recommended Books;			Explain the following: a. Apparent power; b. Reactive power; c. Active power.
General Objective 2: Know simple integrated circuit (IC) and its ratings.						
4 - 7	2.1 Define integrated circuit (IC). 2.2 List types of ICs. 2.3 Explain features of 2.2. 2.4 Explain the following types of ratings: a. Noise; b. Propagation delay; c. Fan in and Fan out; d. Power dissipation; e. Packaging density; f. Clock frequency.	• Explain variety of ICs. • Explain applications of IC. • Describe small, medium, large scales etc integrations in ICs. • Explain surface mount, through	Whiteboard; Marker; Overhead Projector; Recommended Books;			Explain the following types of ratings: a. Noise; b. Propagation delay; c. Fan in and Fan out; d. Power dissipation; e. Packaging density; Clock frequency

	2.5 Explain the levels of IC integration. 2.6 Explain SSI, MSI, LSI, VLSI and ULSI. 2.7 Explain simple IC packaging.	hole etc IC packaging.				
General Objective 3: Understand time domain analysis of RC, RL and RLC circuits						
8 - 11	3.1 Explain the meaning of transients. 3.2 Sketch the growth and decay curves in RC circuits 3.3 Derive formulae for current & voltage growths and decay in RC circuits. 3.4 Define time constant 3.5 Explain time constant in RC and circuits. 3.6 Derive expressions for the growth and decay of voltage and current in RL circuits. 3.7 Sketch curves for growth and decay of current and voltage in RL circuits. 3.8 Explain the need for connecting a resistor in parallel with an inductor 3.9 Derive expressions for growth and decay of current in RLC circuits. 3.10 Derive expressions for the time constant and natural frequency for RLC circuits. 3.11 Solve problems involving transients in RC., RL and RLC circuits.	• Teacher should illustrate domain analysis of RC, RL, RLC circuit with appropriate diagrams and models	Whiteboard; Marker; Overhead Projector; Recommended Books;			Derive expressions for the growth and decay of voltage and current in RC, RL and RLC circuits.
General Objective 4: Understand the magnetic coupling phenomena						

12 - 15	4.1 Describe magnetic coupling. 4.2 Define mutual inductance. 4.3 Determine the polarity of coupled coils. 4.4 Define coefficient of coupling. 4.5 Define an equivalent circuit for magnetically coupled coils. 4.6 Define an ideal transformer. 4.7 Use 4.5 to derive an equivalent circuit of an ideal transformer. 4.8 Explain with the aid of sketches, an equivalent circuit of a practical transformer. 4.9 State applications of magnetic couplings.	• Explain the applications of magnetic couplings in electronic and computer devices.	Whiteboard; Marker; Overhead Projector; Recommended Books;			Define mutual inductance, coefficient of coupling. an equivalent circuit for magnetically coupled coils and an ideal transformer.

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	40
Course work/ assignment	To be assessed by the teacher	20
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 241	CONTACT HRS: 45 HRS
COURSE: INTRODUCTION TO MICROPROCESORS & ASSEMBLY LANGUAGE	COURSES UNIT 3.0	
Goal: This course is designed to enable students to acquire the basic knowledge and skill in microprocessor & assembly language programming.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: **1.** Understand the concepts of microprogramming and Microprocessors **2.** Know the basic terms in assembly language. **3.** Understand the different instruction formats. **4.** Know the representative groups of instruction in the instruction set **5.** Understand the process of running assembly language programs.		

Programme: National Diploma in Computer Engineering Technology		Course code: CTE 241		Contact Hours: 45Hrs	
Course: INTRODUCTION TO MICROPROCESSORS & ASSEMBLY LANGUAGE				Theoretical: 1	
Year: Two Semester: Four		Pre-requisite: None		Practical:2	
General Objective 1.0: Understand the concepts of microprogramming and Microprocessors					
Week	Theoretical Content			Practical Content	
	Specific Learning Objectives	Teacher's activities	Resources	Specific Learning Objectives	Teacher's activities	Evaluation
1-3	**1.1** Define the term micro-programming. **1.2** Explain the microprogram system and hard-wired system and explain the function of each component. **1.3** Explain the functions of a microprocessor in a computer system. **1.4** State the limitations of hardwired logic and the justification for using microprocessors. **1.5** Describe the basic structure of a microprocessor and their characteristics.	Illustrate the differences between microprogram and hard-wired system in the design phase of digital computers. Show a well labeled diagram of a microprocessor and their components.	White Board multimedia projectors & screen, Laptop, Tablets, PCs, Textbooks, online resources, lecture notes, Charts, and writing materials. Microprocessor training kits,	Draw the control section of a digital computer. Identify different types of microprocessors and their specific characteristics.	Demonstrate the design of the control section of a digital computer as a control sequence of control signal Guide students to Identify different types of microprocessors and how it works with the main memories and I/Os.	Explain the organization of a microprocessor Describe the main parts of a microprocessor: • Arithmetic/logic unit • Control unit • Registers • Bus unit

General Objective 2: Know the basic terms in assembly language.						
4-5	**2.1** Define the following Terms: Operation code operand, instruction and registers. **2.2** Explain machine instructions in digital computer system. **2.3** Explain the differences between a machine language and assembly language.	Illustrate with examples what is meant by machine instruction. Distinguish with examples a machine language and assembly language.	White Board & Marker Multimedia projectors & screen, Laptop, Tablets, PCs,	Explain machine language and assembly language with examples.	Show examples machine language and assembly language.	Describe with appropriate examples the machine language and assembly language.
General Objective 3: Understand the different instruction formats.						
6-8	**3.1** Explain instruction formats. **3.2** Explain the field of an instruction format. **3.3** Explain the types and function of registers. **3.4** Describe different types of instructions: register – register memory-	Explain instruction formats. Explain the field of an instruction format. Describe different types of addressing modes: relative, absolute, register, immediate, and indexed.	White Board multimedia projectors & screen, Textbooks, online resources, lecture notes, Charts, and writing materials.	Illustrate different types of instructions: register –register, memory- register, indexed register and immediate operand instructions.	Guide the students to demonstrate how 8, 16, 32 and 64-bit values can be used in assembly code List examples of each types of addressing modes.	State the instruction formats of an assembly language program. Describe the functions of registers List different types of instructions modes with examples.

	register, indexed register and immediate operand instructions.					
General Objective 4: Know the representative groups of instruction in the instruction set.						
9-13	**4.1** Define an instruction set. **4.2** Describe arithmetic instruction: addition, subtraction, multiplication and division. **4.3** Describe AND, OR and exclusive NOR instruction. **4.4** Describe the branch instruction: conditional and unconditional. **4.5** Describe, compare instruction. **4.6** Describe bit manipulation instruction. **4.7** Describe MOV instructions. **4.8** Explain input/output instructions.	Describe and write programming code for the basic arithmetic and logic operations available in assembly language Implement the conditional and unconditional branch instructions. Illustrate with programming code the use of branching, flags, stacks, procedures, macros, and interrupts.	Laptop, Tablets, PCs, lecture notes, Stand-alone assembler such as MASM or TASM	Run samples of assembly language programming code for arithmetic and logic operations. Implement the conditional and unconditional branch instructions. Illustrate with programming code the use of branching, flags, stacks, procedures, macros, and interrupts.	Run samples of assembly language programming code for arithmetic and logic operations. Run assembly language codes using the conditional and unconditional branch instructions. Run program codes with the use of branching, flags, stacks, procedures, macros, and interrupts.	Write programming code for the basic arithmetic and logic operations in assembly language Write an assembly language codes using the conditional and unconditional branch instructions. Write program code with examples of branching, flags, stacks, procedures, macros, and interrupts.

General Objective 5: Understand the process of running assembly language programs.						
14-15	**5.1** Describe string operations. **5.2** Write assembly language code using a variety of string operations including search and search & replace algorithm.	Describe the command sequence required to run an assembly language program using a variety of string operations.	Laptop, Tablets, PCs, lecture notes, Stand-alone assembler such as MASM or TASM	Explain the running of assembly language using a variety of string operations.	Demonstrate and run assembly language program using a variety of string operations including search and search & replace algorithm. .	Write variety of programming code using inline assembly language programming

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: **CTE 242**	**CONTACT HRS: 45 HRS**
COURSE: COMPUTER WORKSHOP PRACTICE II	**COURSES UNIT 3.0**	
Goal: This course is intended to train students in general corrective maintenance; diagnostic techniques of circuit diagram and indentify the components contained therein.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1.0 Understand the circuit diagrams of monitors, UPS Power Packs etc. 2.0 Understand the principles of operation and use of basic electronic measuring instruments in trouble shooting. 3.0 Know diagnostic techniques involved in corrective maintenance. 4.0 Trace faults on the various components of the circuits using a modular approach.		

Theoretical Content			Practical Content			
GENERAL OBJECTIVE 1: Understand the circuit diagrams of monitors, UPS power packs etc.						
Week	**Specific Learning Outcomes**	**Teacher's Activities**	**Learning Resources**	**Specific Learning Outcomes**	**Teacher's Activities**	**Evaluation**
1-4	1.1 Describe the application of circuit diagrams of computers and its peripherals. 1.2 Explain the components in monitors, UPS, power packs etc.	Explain the circuit diagrams of the following:: computer tablets, notebooks, desktops, servers, printers, switches, routers etc	Textbooks, lot of computer wiring diagrams, multimedia projectors, slides, video, online resources, computers	Identify the components in Monitors, UPS, Power packs etc.	Obtain the circuit diagrams of computers, input and output devices, secondary storage devices etc Wear anti static wrist strap, mats and bags	
GENERAL OBJECTIVE 2: Understand the principles of operation and use of basic electronic measuring instruments in troubleshooting.						
5-8	2.1 Describe the uses of multimeter, oscilloscope to test the various components on board/cards such as: resistors, diodes, transistors, ICs etc. 2.2 Explain basic trouble-shooting techniques in computer fault diagnosis e.g. fault identification by eliminations. 2.3 Explain types of cables used by computers and their applications. 2.4 Describe methods of testing cables, as well as the instruments used for	Use power points to display different types of tools and instruments Describe methods of troubleshooting Explain the steps to troubleshoot computers and its peripherals	Computer Technician toolkits, multimedia projectors, slides, video, online resources, laboratory manuals, computers, computer components	Use multimeter, oscilloscope to test the various components on board/cards such as: resistors, diodes, transistors, ICS etc.	Show the students commonly used tools and instruments Display types of cables used by computers	

	testing: i. Twisted pair cable. ii. Coaxial cables iii. RS-232 standard communication cables iv. Fibre optic cable					
GENERAL OBJECTIVE 3: Know diagnostic techniques involved in corrective maintenance.						
9-11	3.1 Explain the need for diagnostic software: Disk manager, Check-kit, Norton, PC Tools. 3.2 Explain some utilities in MS-windows such as Scandisk, defrag, etc and other types of operating systems.. 3.3 Describe the applications of diagnostic software in corrective maintenance. 3.4 Explain the importance and application of anti-virus kits in detection, cure and prevention of virus.	Differentiate between hardware and software problems Give examples of hardware and software problems Describe the importance and application of firewall Explain the procedure to update computer software	Computer Technician toolkits, multimedia projectors, slides, video, online resources, laboratory manuals, lot of diagnostic software	Install reliable and current antivirus software on the computer Use diagnostic software in corrective Maintenance. Use anti-virus kits in detection, cure and prevention of virus.	Run an uninstaller program to correct software-related problem Explain how to use disk defragmenter, scan Disk, Disk Cleanup, Describe how to protect computers from malwares, viruses, spywares, Trojans and worms etc\	
GENERAL OBJECTIVE 4: Trace faults on the various components of the circuits using a modular approach.						
12-15	4.1 Describe methods of identifying faults on various components of the circuits: Monitor, UPS, Power pack and Boards and cards etc. 4.2 Describe correction of errors logic using modular approach.	Check for possible causes of faults Explain how to remove dust from computers using air blowers Explain how to perform the Power On Self Test	Computer Technician toolkits, multimedia projectors, slides, video, online resources, laboratory	Trace and identify faults on various components of the circuits and correct the errors logic using modular approach:	Check for malfunctioned power supply units, components, overheating, insufficient Random access memory, partial contact, blank	

	4.3 Explain fault tracing in various components of the circuits: Monitor, UPS, Power pack and Boards and cards etc.	(POST) Check the CMOS Set Up program Correct configuration problems	manuals, lot of diagnostic software	Monitor, UPS, Power pack and Boards and cards etc.	screen, blue screen etc Explain the process of replacing power supply, hard drive, RAM Describe how to install printers' drivers, troubleshoot and fix printers' error messages	

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and skills	40
Test	At least 1 progress test for feedback.	20
Practical / Projects	To be assessed by the teacher	40
Total		100

Programme: National Diploma in Computer Engineering Technology	Course Code: CTE 243	Contact Hours: 30 Hours
Course: OPERATING SYSTEMS I	Semester 4	Theoretical: 2 Hours/week
Year 2	Pre-requisite:	
Goal: This course is designed to teach students the functions of Operating System		
General Objectives: On completion of this course the student should be able to: 1. Know the concepts of an operating system 2. Know the classification and different types of Operating System 3. Know the functions, characteristics, and components of Operating System 4. Know services, properties, and structure of an Operating System 5. Understand the general concept of system programming 6. Understand the use of utilities and libraries		

	Theoretical Content	Practical Content

	General Objective 1: Know the concept of an Operating System.					
Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1-2	1.1 Explain the generic idea of an operating system. 1.2 Define Operating System (OS). 1.3 Explain the evolution of the operating system. 1.4 Explain the importance of Operating Systems using real-life examples e.g. DOS, Windows, UNIX, etc. 1.5 Describe the basic organisation and architecture of a computer system based on operating system platform. 1.6 List the merits and demerits of operating system. 1.7 Explain the goals (resource management) of an operating system.	Explain Operating System (OS) Explain the importance of OS, Explain computer organisation and architecture based on the OS	Presentation package Multimedia Projector PC loaded with virtualization software with different OS installed. Textbooks			Describe how to operate various OS
	General Objective 2: Know the classification and different types of Operating Systems.					
3-5	2.1 Classify operating systems into closed source and open source. 2.2 Give examples of closed-source and open-source operating system. 2.3 Explain types of operating system. i.e Batch, Real-	Explain closed source and open source operating system with examples. Classify operating systems into batch, real time, timesharing and networking.	Presentation package Multimedia Projector PC loaded with virtualization software with			Explain the design of various OS

	time, Time-sharing, Distributed and Networking operating systems. 2.4 Give some examples of Batch, Real-time, Timesharing, Distributed and Networking operating systems. 2.5 List the advantages and disadvantages of the various types of operating system. 2.6 Explain the differences between Hard real time operating system and soft real time operating system 2.7 Explain operating system computing environments, e.g. Mobile system, Distributed system, Client-server system, and virtualization system.	Define each of them, with examples Textbooks	different OS installed.			
	General Objective 3: Know the functions, characteristics, and components of Operating Systems.					
6 - 7	3.1 State the functions of operating systems in relation to memory management, processor management, device management and interrupt handling and information management. 3.2 State the characteristics of operating systems: concurrency, sharing,	Explain how operating system aids the functionality of the memory, processor, I/O devices and interrupt handlers. Explain the characteristics of operating systems. Explain the features of operating systems.	Presentation package Multimedia Projector PC loaded with virtualization software with different OS installed. Textbooks			Practice the use of different DOS commands. Explain operating systems files: - IO.SYS, COMMAND.COM,

	long-term storage and non-determinacy. 3.3 State the features of operating systems: efficiency, reliability, maintainability and size. 3.4 Explain the components of operating system, e.g kernel, Process execution, Interrupt, Memory management, Multitasking, Networking, User interface, and Security. 3.5 Explain the parameters used to measure operating system performance, e.g Throughput, Response time and Execution time. 3.6 Explain operating systems files: - IO.SYS, COMMAND.COM, CONFIG.SYS 3.7 Describe the functions of the basic DOS commands; i.e. FORMAT, DIR, CHKDSK, TYPE, BACKUP, MODE, SYS, AUTOEXEC, DISCOMP, FDISK, etc.	Explain the components of an operating system Define throughput, response time and Execution time Describe operating systems files; IO.SYS, COMMAND.COM, CONFIG.SYS Explain the functions of DOS commands				CONFIG.SYS
General Objective 4: Know the services, properties, and structure of an Operating System.						
8 - 9	4.1 Explain the services provided by the operating system: - User interface,	Explain the services provided by the operating system.	Presentation package			

	Program execution, I/O operation, File system manipulation, Communication, Error detection, Resource Allocation, and protection. 4.2 Explain the properties of an operating system: - Batch processing, Multitasking, Multiprogramming, Interactivity, Real time system, Spooling, Distributed Environment. 4.3 List the advantages and disadvantages of each of the properties of an operating system. 4.4 Describe the structure of an operating system, i.e kernel, system calls, shells and command interpreter, processes, and files. 4.5 Explain the architecture of OS (Monolithic, Micro-kernel, Layered, Kernel) 4.6 Explain process management. 4.7 Explain process states and process control block (PCB).	Describe the properties of an operating system.	Multimedia Projector PC loaded with virtualization software with different OS installed. Textbooks			

	4.8 Describe process scheduling and types of scheduling. 4.9 Explain the concept of CPU scheduling and its algorithm.					
General Objective 5: Understand the general concept of system programming.						
10-11	5.1 Define Systems Programming. 5.2 Define Application Programming. 5.3 Differentiate between a systems program and an application program. 5.4 Identify areas involved in systems programming e.g. compilers, assemblers, operating systems, device drivers, interrupt handlers. 5.5 Explain the differences between Operating system and application programs.	Describe System Programming. Define Application Programming. Explain the difference between system program and application program. Explain compilers, assemblers etc.	Textbooks Presentation package Multimedia Projector PC loaded with virtualization software with different OS installed.			
	General Objective 6: Understand the use of utilities and libraries					
12-13	6.1 Define Utilities. 6.2 Explain Utilities. 6.3 Define Library. 6.4 Explain Libraries. 6.5 Relate utilities to Libraries 6.6 Implement libraries and utility program.	Explain utilities and libraries, state their types.	Presentation package Multimedia Projector PC loaded with virtualization			

			software with different OS installed. Textbooks			
	General Objective 7: Understand Input / Output devices handlers					
14-15	7.1 Explain CPU states. 7.2 Define I/O processing. 7.3 Explain Direct Memory Access. 7.4 Explain polling. 7.5 Describe interrupts, masking traps. 7.6 List out the different types of interrupt, i.e. Hardware and Software Interrupt. 7.7 Describe traps 7.8 Differentiate between traps and interrupts. 7.9 Describe deadlock. 7.10 Explain how to prevent deadlock. 7.11 Explain semaphore, its types and operations	Explain I/O processing Explain interrupts Explain the difference between traps and interrupts Define interrupt vector Describe the use of interrupt vector State the use of masking in relation to interrupt Describe traps Explain levels of interrupt	Presentation package Multimedia Projector PC loaded with virtualization software with different OS installed Textbooks			

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 1 progress test for feedback.	20
Course work/ assignment	To be assessed by the teacher	20
Total		100

Programme: **National Diploma in Computer Engineering Technology**	Course Code: **CTE 244**	Contact Hours: 45 Hrs
Course: **COMPUTER NETWORKING**	Semester: 1	Theoretical: 1 hour /week
Year: 1	Pre-requisite:	Practical: 2 hours /week
Goal: This course is intended to equip students with the practical knowledge in computer networking.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand the basic concepts of computer networking. 2. Know the hardware components of computer networks and their functions. 3. Understand Network planning and design 4. Know the different Types of network Connections 5. Understand how the Internet works today, applications of theory in current technology and Wireless Network Access 6. Understand the Open System Interconnection (OSI) Model and the TCP/IP Model and Networks using IPv4 and IPv6 7. Understand how to construct and debug a small-medium IP network		

Theoretical Content				Practical Content		
GENERAL OBJECTIVE 1: Understand the basic concepts of computer networking.						
Week	**Specific Learning Outcomes**	**Teacher's Activities**	**Learning Resources**	**Specific Practical Outcomes**	**Instructor's Activities**	**Learning Resources**
1- 3	1.1 Define computer network. 1.2 State the advantages and disadvantages of a computer network. 1.3 Explain types of Networks: LAN, MAN, CAN and WAN. 1.4 Explain perimeter networks, addressing VLANs, wired and Wireless LAN. 1.5 Explain leased lines, dial-up, ISDN, VPN, T1, T3, E1, E3, DSL, cable modem etc, and their characteristics (speed, availability). 1.6 Differentiate between client and server computers. 1.7 Differentiate between wired and wireless networks.	• Define Computer Network and explain the concepts of the Internet, Intranet, and Ethernet. • Explain Virtual Private Network (VPN), security zones and firewalls • Explain the advantages and disadvantages of a computer networks. • Explain types of Networks: LAN, MAN and WAN • Describe perimeter networks; addressing; reserved address ranges for local use (including local loopback ip), VLANs; wired LAN and wireless LAN. • Describe leased lines, dial-up, ISDN, VPN, T1,	Marker and White Board, Multimedia projector, Switches, Routers, Network Simulation Software	• Identify clients and Servers in selected networks • Identify wired and wireless networks	• Guide students to identify clients and Servers in selected networks • Guide students to Identify wired and wireless networks	• Networked PCs with clients and servers • Practical Manual / Workbook

		T3, E1, E3, DSL, cable modem etc, and their characteristics (speed, availability). • Explain Client and Server Computers • Distinguished between Wired and Wireless Networks				
GENERAL OBJECTIVE 2: Know the hardware components of computer networks and their functions.						
4- 5	2.1 List the hardware components of computer network: Router, switches, repeater, Gateway and cables. 2.2 Differentiate between Hub and Switch. 2.3 Explain Repeaters and their functions. 2.4 Explain bridges and their functions. 2.5 Explain routers and their functions. 2.6 Describe Network Interface Card (NIC) and functions.	• Describe different network hardware components: Router, switches, repeater, Gateway and cables. • Explain functions of components listed above with respect to routing data, traffic, remote connections, switching types and MAC table. • Understand capabilities of hubs versus switches, virtual switches, Static routing, dynamic routing, routing protocols, (RIP vs. OSPF),	Marker and White Board. Multimedia projector Switches Routers Network Simulation Software	• Identify the different network hardware components and their functions	Guide students to Identify the different network hardware components and their functions	• Networked PCs with clients and servers • Practical Manual / Workbook

		NAT, QoS etc.				
GENERAL OBJECTIVE 3: Understand network planning and design.						
6 - 7	3.1 Define network planning and design. 3.2 Outline the importance of network planning. 3.3 Outline the steps involved in designing a network. 3.4 Explain network topology and access methods.	• Explain Network Planning and Design • Outline the importance of network planning • Outline the steps involved in designing a network • Describe network topology, types and access methods	Marker and White Board, multimedia projector, Switches, Routers, Network Simulation Software	• Plan and Design a networks using network diagrams to illustrate types of network topologies	Guide students to Plan and Design networks using network diagrams.	• Networked PCs with clients and servers • Practical Manual / Workbook
GENERAL OBJECTIVE 4: Know the Different Types of Network Connections.						
8 - 9	4.1 Describe point-to-point, peer-to-peer, client/server based networks. 4.2 Explain types of cable termination and suitable cables for each. 4.3 State advantages and disadvantages of each connection type in 2.1 above. 4.4 Explain the types of Servers: print, mails etc. 4.5 Explain server reliability, availability and data integrity.	• Describe Point-to-point, Peer-to-peer, Client / Server based networks • Explain cable types and their characteristics, including media segment length and speed; (fiber optic; twisted pair shielded or unshielded; cat5 and cat6 cabling, wireless; susceptibility to external interference) • Explain types of	Marker and White Board, multimedia projector, Switches, Routers, Network Simulation Software	• Set up point-to-point network. • Set up peer-to-peer network. • Create different types of network cables • Create a fibre optics cable. • Connect devices using RJ45 Cable, fibre optics etc.	Guide student to set up point-to-point network. Guide student to Set up peer-to-peer network.	• Networked PCs with clients and servers • Practical Manual / Workbook

		Cable termination and suitable cables for each. • State advantages and Disadvantages of each connection type. • Explain the types of Servers: print, mails etc. • Describe Server reliability, availability and data integrity				
GENERAL OBJECTIVE 5: Understand how the Internet works today, applications of theory in current technology and Wireless Network Access						
10-11	5.1 Differentiate between Internet and Ethernet. 5.2 Explain the various types of internet connectivity. 5.3 Define wireless network and types of Access. 5.4 Differentiate between dial-up, wireless and broad band Internet access. 5.5 Explain the advantages of broad band over dial-up and wireless access. 5.6 Explain wireless network standards. 5.7 Explain types of network security	• Distinguish between Internet and Extranet • Describe the various types of internet connectivity. • Explain Wireless Network and types of Access. • Distinguished between Dial-up, wireless and Broad band Internet access. • Explain the Advantages of Broad band Over Dial-up and	Marker and White Board, multimedia projector, Switches, Routers, Network Simulation Software	• Set up a network with dial-up and broadband internet access • Carryout functionality test	• Guide students to set up a network with dial-up and broadband internet access • Guide students to carryout functionality test	• Networked PCs with clients and servers • Practical Manual / Workboo • Network Analyser Test and Commissio ned Computer.

		Wireless Access Network. • Explain types of wireless networking standards and their characteristics (802.11a, b, g, n, including different GHz ranges), • Explain types of network security (for example, WPA/WEP/802.1 X), point-to--point (P2P) wireless, ad hoc networks, wireless bridging etc				
GENERAL OBJECTIVE 6: Understand the Open System Interconnection (OSI) Model, TCP/IP Model and IP-Address on Networks using IPv4 and IPv6.						
12-13	6.1 Define OSI Model. 6.2 Explain TCP/IP Reference Model. 6.3 Differentiate between TCP/IP and OSI Model. 6.4 State the functions of each layer of the OSI Model. 6.5 Explain the concept of IP addressing and types. 6.6 Explain the term IPV 4 6.7 State the classes of IP addresses. 6.8 Explain the range of IP-address classes.	• Explain OSI Model. • Explain the TCP/IP Model • Explain the differences between TCP/IP and OSI Model. • Explain the functions of each layer of the OSI Model • Explain the concept of IP addressing and	Marker and White Board, multimedia projector, Switches, Routers, Network Simulation Software	• Identify the layers of OSI Reference Model • Manually assign a static IP Address on NIC. • Develop test procedure and Carryout functionality test • Generate test results and compile reports	• Guide students to identify the layers of OSI Model • Guide students on how to ping; tracert; pathping; Telnet; IPconfig; etc. • Guide students to manually assign a static IP address on NIC.	• Networked PCs with clients and servers • Practical Manual / Workbook

	6.9 Describe VLSM/ Subnetting IPV4.	types. • Explain the term IPV 4. • Explain the classes of IP addresses. • Explain the range of IP address classes. • Describe VLSM/ Subnetting IPV4			• Guide students to develop test procedure and Carryout functionality test • Guide students to generate test results and compile reports	
GENERAL OBJECTIVE 7: Know how to construct and debug a small-medium IP network						
14-15	7.1 Explain classes of IP-address and importance in the network. 7.2 Explain static and dynamic IP-address. 7.3 Explain the challenges of Fibre connectivity and the policies of government. 7.4 Explain obstacles to Internet growth in Nigeria. 7.5 Explain the factors militating against Internet penetration in Nigeria. 7.6 Explain government policies on internet access in Nigeria. 7.7 Explain internet Governance and e-Commerce.	• Explain different classes of IP-address and its categories of uses • Explain challenges of internetwork among small-medium networks infrastructure in Nigeria. • Explain the factors militating against internet penetration in Nigeria • Explain the problems of fibre connectivity and government policies	Marker and White Board, multimedia projector, Switches, Routers, Network Simulation Software	• Identify classes of IP-address and importance in the network • Manually assign a static IP Address on NIC. • Develop test procedure and Carryout functionality test on IP-Address on NIC.	• Guide students to identify assign the IP-address manually and automatically • Guide students on how to troubleshoot LAN; e.g. ping; tracert; pathping; Telnet; IPconfig; etc. • Guide students to generate test results and compile reports • Identify obstacles to Internet growth in Nigeria. • Explain factors militating against Internet	• Networked PCs with clients and servers • Practical Manual / Workbook

					penetration	

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY	CODE: CTE 245	CONTACT HRS: 45 HRS
COURSE: TELECOMMUNICATION ENGINEERING I	COURSES UNIT 3.0	Semester 4
Goal: This course is designed to enable students acquire basic knowledge and skills in Telecommunication Engineering.		
GENERAL OBJECTIVES: On completion of this module, the student should be able to: 1. Understand the basic principles of telecommunication systems. 2. Understand the principles of operation and application various transducers. 3. Understand the basic principles of modulation and demodulation. 4. Understand the principles of amplitude modulation and frequency modulation. 5. Understand the principle of the radio receivers. 6. Know the principles of black and white television transmission. 7. Know various frequency bands within the radio spectrum. 8. Understand the principles of electromagnetic wave radiation. 9. Understand the principles of radio wave propagation. 10. Analyze the characteristics of simple telecommunication circuits.		

Programme: National Diploma in Computer Engineering Technology			Course code: CTE 245		Contact Hours:45 Hrs
Course: TELECOMMUNICATION ENGINEERING I			Theoretical: 1 Hrs/Week		
Year: Two Semester: Four		Pre-requisite:	Practical: 2 Hrs/Week		
General Objective 1: Understand the basic principles of telecommunication systems					
Week	Theoretical Content			Practical Content		
	Specific Learning Objectives	Teacher's activities	Resources	Specific Learning Objectives	Teacher's activities	Evaluation
1	1.1 Draw the block diagram of a simple communication system showing:- a. Input transducer; b. Transmitter; c. Transmission channel; d. Receivers; e. Output transducer. 1.2 Explain the function of the blocks listed in 1.1 above.	Draw a typical Telecommunication system and explain how it works. Explain how a signal is generated from the transducer. List various types of transducer that can be used for telecommunications. Explain the need for modulation.	• Students to visit Broadcasting Station transmitter station & Exchange, textbooks,			Illustrate a. Input transducer; b. Transmitter; c. Transmission channel; d. Receivers; e. Output transducer
General Objective 2: Understand the principles of operation and application of various transducers						
2	2.1 Describe sound transducers; a. Microphones b. loud speakers 2.2 Explain, with the aid of diagrams, the principles of operation and uses of: a. Carbon microphone; b. Crystal microphone; c. Moving coil loudspeaker; d. Moving iron telephone receiver	• Explain the uses and operations of transducers	broadcasting stations, textbooks	visit broadcasting stations, textbooks	Guide students in a to visit to broadcasting stations, textbooks	Explain, with the aid of diagrams, the principles of operation and uses of: a. Carbon microphone; b. Crystal microphone; c. Moving coil loudspeaker; d. Moving iron

	e. Capacitor microphone					telephone receiver e. Capacitor microphone
General Objective 3: Understand the basic principles of modulation and demodulation						
3	3.1 Explain the significance of modulation and demodulation in communication systems. 3.2 Explain the following modulation processes:- a. Amplitude modulation; b. Frequency modulation. 3.3 Explain the following regarding amplitude modulation: a. side frequencies; b. side band; c. modulation index; d. modulation envelope; e. bandwidth. 3.4 Solve problems involving the following: a. Modulation index; b. Bandwidth. 3.5 Explain why F.M. has a wider. Bandwidth than A.M. 3.6 Compare the parameters of F.M. with A.M. 3.7 Solve problems involving 3.5 and 3.6 above.	Explain the applications of Modulation and demodulation to Communication systems	Frequency deviation with FM Modulated signal	Perform experiment on amplitude Modulation with signals in audio Frequency band Perform experiment on amplitude Demodulation with AM modulated signal Perform experiment to determine the frequency deviation with FM modulated signal	Perform experiment on amplitude Modulation with signals in audio Frequency band Perform experiment on amplitude Demodulation with AM modulated signal Perform experiment to determine the frequency deviation with FM modulated signal	Explain the significance of modulation and demodulation in communication systems. Explain the following terms regarding frequency modulation:- a. modulation index; b. deviation ratio; c. frequency deviation; d. system deviation; e. frequency swing
General Objective 4: Understand the principles of amplitude modulation and frequency modulation						
4	4.1 Explain the working principles of amplitude demodulators. 4.2 Explain the working principles of frequency demodulators.	Explain the working principles of amplitude demodulators				Explain the working principles of Amplitude demodulators and

		4.2 Explain the working principles of frequency demodulators				Frequency demodulators
General Objective 5: Understand the principles of operation of the radio receiver						
5-6	5.1 Draw the block diagram of the following radio receivers. a. straight; b. super heterodyne. 5.2 Explain the function of each block diagram in 5.1 5.3 Explain the choice of intermediate frequency in the super heterodyne receiver. 5.4 Explain the following phenomena in super heterodyne receiver:- a. adjacent channel interference b. image interference. 5.5 Explain the use of double super heterodyne to suppress image and adjacent channel interferences. 5.6 Explain the function of the automatic gain control (A.G.C.) 5.7 Explain with the aid of a block diagram, the working principle of an F.M. radio receiver.	Explain as listed in specific learning outcome 5.1 to	Dismantle TV set and other tools	Illustrate with the aid of a block diagram, the working principle of an F.M. radio receiver. Draw Block diagram of radio receiver	Encourage students to illustrate with the aid of a block diagram, the working principle of an F.M. radio receiver. Draw Block diagram of radio Receiver.	Explain the following phenomena in super heterodyne receiver:- a. adjacent channel interference b. image interference Explain the function of the automatic gain control (A.G.C.) Explain with the aid of a block diagram, the working principle of an F.M. radio receiver.
General Objective 6: Know the principles of black and white television transmission						
7-8	6.1 Differentiate between Radio and Black/White T.V. Transmission. 6.2 Explain with diagrams of the	List out differences between Radio and Black/White T.V.	Radio, Black and White TV, Radio, Black	Draw block diagrams of the following	Guide students to draw block diagrams of the	Explain a. amplitude modulation;

	following radio transmitters using: a. amplitude modulation; b. frequency modulation. 6.3 Explain the function of each block in 6.2. 6.4 Draw the block diagram of a television transmitter (black & white). 6.5 Explain the function of each block in 6.4. 6.6 Explain how vision and sound signals are generated separately and transmitted together.	Transmission Explain a. amplitude modulation; b. frequency modulation. and their functions Explain how vision and sound signals are generated separately and transmitted together. Explain how vision and sound signals are generated separately and transmitted together.	and White TV	radio transmitters using: a. amplitude modulation; b. frequency modulation	following radio transmitters using: a. amplitude modulation; b. frequency modulation	b. frequency modulation. and their functions Explain how vision and sound signals are generated separately and transmitted together. Explain how vision and sound signals are generated separately and transmitted together.
General Objective 7: Know various frequency bands within the radio spectrum						
9	7.1 Classify radio frequencies 7.2 List the frequency ranges allocated to each of the following bands and their uses: a. (e.l.f.) extremely lowfrequency; b. (v.l.f.) very low frequency c. (l.f.) low frequency; d. (m.f.) medium frequency; e. (h.f.) high frequency; f. (v.h.f.) very high frequency; g. (u.h.f.) ultra high frequency; h. (s.h.f.) super high	Show the diagrams of different types of antenna and show how Signals are propagated.	Radio, Black and White TV	Illustrate different types of antenna and show how Signals are propagated.	Show the diagrams of different types of antenna and show how Signals are propagated.	Explain the function of different types of antenna and show how Signals are propagated.

	frequency; i. (e.h.f.) extremely high frequency.					
General Objective 8: Understand the principles of electro-magnetic wave radiation						
10-11	8.1 Explain the function of an aerial as a radiator. 8.2 Appreciate the current and voltage distribution of a dipole. 8.3 Explain aerial impedance and radiation resistance. 8.4 Define an isotropic radiator. 8.5 Define the gain of an aerial. 8.6 Define the beam width of an aerial. 8.7 Sketch the polar diagram or the radiation pattern of an aerial. 8.8 Sketch the horizontal and vertical plane patterns of a horizontal and vertical dipole. 8.9 Identify various types of aerials: e.g. Yagi, Rhombic, etc. 8.10 Sketch Yagi and rhombic aerials. 8.11 Explain the effect of frequency on aerial dimensions and performance. 8.12 Explain the factors guiding the choice of aerials.	Explain the function of an aerial as a Radiator, current and voltage distribution of a dipole, aerial impedance and radiation resistance. Define an isotropic radiator, the gain of an aerial and the beamwidth of an aerial. Explain way of sketching the horizontal and vertical plane patterns of a horizontal and vertical dipole.	Aerials, textbooks, board, chalk, wave guides and coaxial cables			Explain aerial impedance and radiation resistance
General Objective 9: Understand the principles of radio wave propagation						
12	9.1 Explain the following terms in relation to wave propagation; i. Ground waves; ii. Sky waves; iii. Space waves. 9.2 Explain the existence and usefulness of the troposphere.	Explain wave propagation; a. Ground waves; b. Sky waves; c. Space wave. Explain troposphere	Internet, textbook			Explain a. Ground waves; b. Sky waves; c. Space wave. Explain the various layers of the

	9.3 Explain the effects of the troposphere on propagation below 30MHz. 9.4 Explain the various layers of the ionosphere such as: The D-layer; The E-layer; The F-layer. 9.5 Explain critical and maximum usable frequency. 9.6 Explain optimum working frequency. 9.7 Solve problems involving wave propagation.	and its effects on propagation. Explain the various layers of the ionosphere such as: a. The D-layer; b. The E-layer; c. The F-layer				ionosphere.
General Objective 10: Investigate and analyze the characteristics of simple telecommunication circuits						
13-15	10.1 Explain modulation with signals in audio frequency band 10.2 Explain the effect demodulation with AM modulated signal on amplitude. 10.3 Determine the frequency deviation with FM modulated signal. 10.4 Explain process of frequency demodulation with FM modulated signals. 10.5 Explain process of performing experiments on superheterodyne radio receiver.	Teachers should involve the students in the experiments • Ask the students to submit their reports for assessment	• AM and FM demonstration units, oscilloscope, frequency generator, RF and AF demonstration units, super heterodyne receiver. Skill G Equipment and resources	Determine impedance, radiation resistance, gain, beam-width and radiation power of aerials Carryout experiment to determine the video, composite waveform and sync. pules of TV receiver circuits	Perform experiment on amplitude modulation with signals in audio frequency band Perform experiment on amplitude demodulation with AM modulated signal Perform experiment to determine the frequency deviation with FM modulated signal	Determine the frequency deviation with FM modulated signal Explain process of frequency demodulation with FM modulated signals

					Carryout experiment on frequency demodulation with FM modulated signals Perform experiments on superheterodyne radio receiver Carryout experiment to determine impedance, radiation resistance, gain, beam-width and radiation power of aerials Carryout experiment to determine the video, composite waveform and sync.pules of TV receiver circuits	

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	40
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	40
Course work/ assignment	To be assessed by the teacher	10
Total		100

LIST OF MINIMUM RESOURCES FOR ND COMPUTER ENGINEERING TECHNOLOGY

1. LABORATORIES

EXCLUSIVE	SHARED
a. Computer Technology	a. Basic Electricity, Measurement and Instrumentation (*See ND Electrical/Electronic Engineering Technology Curriculum for details*) b. Electronics/Communication (*See ND Electrical/Electronic Engineering Technology Curriculum for details*)

2. WORKSHOPS

EXCLUSIVE	SHARED
a. Computer Maintenance and Repairs b. Computer Networking	a. Electrical Installation (*See ND Electrical/Electronic Engineering Technology Curriculum for details*) b. Electrical Maintenance and Repairs (*See ND Electrical/Electronic Engineering Technology Curriculum for details*) c. Mechanical

3. OTHER FACILITES

EXCLUSIVE	SHARED
a. Computer Studio/Software laboratory	a. Drawing Studio (*See ND Mechanical Engineering Technology Curriculum for details*)

A. COMPUTER TECHNOLOOGY LABORATORY (NATIONAL DIPLOMA)

S/N	DESCRIPTION OF ITEMS	QUANTITY
1.	Logic Tutors	5
2.	Digital system trainer	5
3.	Microcomputer interface trainer kit	5
4.	Microcomputer trainer	5
5.	Oscilloscope (Dual trace, high frequency 100 MHz)	3
6.	Digital Oscilloscope, 200 MHz and above	3
7.	Logic probe	5
8.	Logic pulser	5
9.	Digital Multimeter	5
10.	IC Tester	5
11.	Frequency counter	5
12.	Function generator	5
13.	DC Power supply (0-12V)	5
14.	Breadboard	5
15.	Discrete components and Integrated Circuits (Analogue and Digital)	Lot
16.	Micro-computer	5
17.	Fire extinguisher	1
18.	First aid box	1
19.	Safety bucket	1
20.	Safety posters	6

B. COMPUTER MAINTENANCE AND REPAIRS WORKSHOP (NATIONAL DIPLOMA)

S/N	DESCRIPTION OF ITEMS	QUANTITY
1.	Micro-computer with Linux operating system (Functional)	1
2.	Micro-computers with Microsoft operating system (Functional)	1
3.	Micro-computers with Macintosh operating system (Functional)	1
4.	Micro-computer (Serviceable)	2

5.	Laptop (Serviceable)	2
6.	Smart phones (Servicable)	2
7.	Tablet computer (Serviceable)	2
8.	Model of internal and external parts of the computer system	1
9.	LaserJet Printer (New/Functional)	1
10.	LaserJet Printer (Serviceable)	1
11.	InkJet Printer (New/Functional)	1
12.	InkJet Printer (Serviceable)	1
13.	Plotters	1
14.	Scanner	1
15.	Multimedia projector	1
16.	Computer repairs toolbox	10
17.	Soldering iron (power rating not more than 20 watt)	15
18.	Soldering sucker	15
19.	Soldering station	5
20.	Air blower	2
21.	Digital Multimeters	10
22.	IC extractors/insertion	5
23.	Digital Oscilloscope dual trace 100MHz	2
24.	Replacement Computer components/parts: - Input devices (keyboard, mouse, camera etc) - Output devices (LCD monitor, speakers etc) - Secondary storage devices (Hard disk drive, CD/DVD drive etc) - Processor and primary storage devices (CPU, RAM, Motherboard etc) - Power supply - Network Interface cards - Fans - Video adapter - Sound Adapter	Lot
25.	DC Power Supply	3
26.	Cleaning kit: Drive lens cleaner Paint brush (2” and 3”)	 3 3

	Duster (Napkin)	3
27.	Computer, printers and smartphone manuals	Varieties
28.	Washing pans	5
29.	Mobile phone repair kit	5
30.	Anti static wrist band	Lot
31.	Antivirus software tool	1
32.	Fire extinguisher	1
33.	First aid box	1
34.	Safety bucket	1
35.	Safety posters	6

C. COMPUTER NETWORKING WORKSHOP (NATIONAL DIPLOMA)

S/N	DESCRIPTION OF ITEMS	QUANTITY
1.	Network testers	2
2.	Computer tool kits	5
3.	Strippers	2
4.	Compression and Crimp tools	2
5.	Insertion and Extraction tools	2
6.	Switches	2
7.	Punch down	2
8.	Computer	5
9.	Ethernet Cable	Lot
10.	RJ 45	Lot
11.	Digital Multimeter	5
12.	LAN Routers	2
13.	Wireless Router	2
14.	Internet Modem	2
15.	Cable tester	2
16.	Fire extinguisher	1
17.	First aid box	1
18.	Safety bucket	1
19.	Safety posters	6

D. COMPUTER STUDIO/SOFTWARE LABORATORY

S/N	DESCRIPTION OF ITEMS	QUANTITY
1.	Computer systems	15
2.	Printer (All-in-one)	1
3.	Multimedia Projector	1
4.	Projector screen	1
5.	Internet modem	1
6.	Software packages - Operating system (Windows, Linux, etc) - Network Operating system - Simulation software (Multisim, Proteus Design, MATLAB, Electronic workbench, Packet Tracer, Scilab, Octave, etc) - Application suites (MS Office suite etc) - Integrated Development Environment (MS Visual studio, NetBeans etc) - Word processing - Spreadsheet - Statistical packages - Graphics packages - Educational packages - BASIC - C Language - Assembler	Varieties
7.	Fire extinguisher	1
8.	First aid box	1
9.	Safety bucket	1
10.	Safety posters	6

E. MECHANICAL WORKSHOP

S/N	DESCRIPTION OF ITEM	QUANTITY
1	Drill Press	
i.	Pillar drilling machine	2
ii.	Bench drill machine with rotating table and steel base	2
	Accessories	
i.	(i) drill sets in boxes	4
ii.	(ii) drills 1/16"x 1/2"	4
iii.	(iii) drills 1mm	4
iv.	(i) Cluck keys – spare	
2	Shaping/Planning Machine	
i.	Shaping machine	1
ii.	Planning machine	1
3	Guillotines	
i.	Kingland type guillotine	1
ii.	Gabro type guillotine	1
4	Lathes	
i.	Turret lathe or capstan lathe	1
ii.	Bench lathe (Melcer -3) Model	1
5	Riveter	
i.	Riveting machine	1
6.	Saw	
i.	Power hacksaw (metal cutting machine) with accessories	1 unit
7	Welding/Fabrication Equipment	
i.	Electric Unit with accessories	2
ii.	Gas Unit with accessories	2
iii.	Welding neds	2
iv.	Brazing equipment	2
v.	Brazing rods	2
vi.	Soldering rods	2
vii.	Safety goggles	2
8	Pliers	
i.	Engineers Combination 6"	6
ii.	Multi-groove 10"	6

iii.	Needle use 6"	6
iv.	Vice grip 10"	6
v.	Slip joint 8"	6
vi.	Diagonal cutting 8"	6
vii.	Long nose 6"	6
viii.	Side cutting	6
9	Punches	
i.	Centre punch 6"x 1/8"	5
ii.	Drift punch 16"	5
iii.	Drive pin punch	5
iv.	Starting punch	5
10	Screw Driver	
i.	Standard .tip l/4"x 4"	5
ii.	Standard tip 5/16"x 16"	5
iii.	Offset straight tip 1 and 2	5
iv.	Straight tip spring clip	5
11	Spanners	
i.	BSW Spanner and Wrench	5
ii.	Open-ended Spanner Sets British Whitworth set Metric set	5
iii.	Ring Spanner sets:	5
iv.	Miniature Spanner sets:	5
v.	Socket spanner set 1/2" drive	5
12	Files	
i.	Bastard 8" (flat, half round, square, round)	5
ii.	Cabinet 8" (flat smooth, 1/2 round smooth, 1/2 round second cut, round second cut).	5
iii.	Flat 8" (second cut, smooth)	5
iv.	Half round 8' (second cut, smooth) 5. Square 8" (second cut, smooth)	5
v.	Handles size 2 to fit above	10
vi.	Needle file set	10
13	Micrometers	
i.	Three sizes (capacities 0-1", 0-2", 0-3" outside set, inside set)	6

14	Rules	
i.	Flexible stainless steel l' rule graduated \n metric one side and 1/8, 1/16, 1/32 on reverse	10
ii.	Heavy duty punch/pull graduated metric/imperial 16ft with locking mechanism	10
15	Fire extinguisher	1
16	First aid box	1
17	Safety bucket	1
18	Safety posters	6

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