# NATIONAL BOARD FOR TECHNICAL EDUCATION

# NATIONAL DIPLOMA

# AND

# HIGHER NATIONAL DIPLOMA

# IN

# COMPUTER ENGINEERING TECHNOLOGY CURRICULUM AND COURSE SPECIFICATIONS

PLOT B, BIDA ROAD, P.M.B. 2239, KADUNA
NATIONAL BOARD FOR TECHNICAL EDUCATION

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# FOREWORD

*This curriculum evolved in two parts is for the National Diploma (ND) and Higher National Diploma (HND) Programmes in Computer Engineering Technology.*

*The curriculum has been structured in unit courses in line with the provision of the National Policy on Education (NPE) which makes it mandatory for all institutions to introduce the credit unit system that allows for the transfer of courses completed in one institution to another similar or higher institution.*

*Also, the content of each course has been spelt out in behavioral objectives to enhance the articulation process if the transfer of the credit between institutions is to be meaningful and acceptable to all institutions and for employers to know the behavior of diplomats of the programme seeking entry level employment in industry.*

*The Board's policy that the producers (institutions) who run the programme should initiate the new curriculum based on the guidelines issued by the Board was fully implemented. Critique workshops where representatives of the academic community, professional bodies, users (employers) and practitioners were present also took place.*

*It is the believe of the Board that the new programme is adequate for the level of programme; and if properly taught, it will produce the type of manpower required by the nation at the technician level provided the resources – qualified teaching staff in number and mix, consumable teaching materials and other facilities are available to teach the programme to students with the correct entry behavior.*

*I wish to express my deep appreciation to the Federal Polytechnic Offa, for initiating the drafts, the academic community, represented by universities, polytechnics, employers' associations – NECA professional association NSE, COAN and the Regulatory body COREN for their very valuable contributions to the new curriculum.*

*It is hoped that the new curriculum if properly implemented, will produce the technical and technologists of our dreams.*

*Engr. (Dr.) A.T. Abdullahi*
*Executive Secretary*

GENERAL INFORMATION ON THE PROGRAMME
NATIONAL DIPLOMA (ND)

Programme Goal and Objectives
The National Diploma Programme in Computer Engineering Technology is designed to produce computer technician to install, maintain and repair computer hardware and its peripherals. More specifically, diplomats of the programme should be able to:

a). Carry out routine maintenance and repair of computer;
b). Design and map out the layout for computers;
c). Install, set up and operate computers;
d). Prepare simple bill of quantities and specifications for computers;
e). Select and use appropriate instruments to carry out simple tests and measurements on all Subsystems in a computer and its peripherals.

NATIONAL DIPLOMA (HND)

Programme Goal and Objectives
The Higher National Diploma (HND) programme in Computer Engineering Technology is designed to impact on the students specialized and useable skills in this field of engineering.
The programme is designed to produce higher technicians in computer engineering technology for the manufacturing and servicing industries. On completion of the programme, the diplomats should be able to:

a). Design electronic circuits for use in modification of computer system;
b). Design electronic and computer installations, wiring and circuit project;
c). Assemble, install and configure computer systems;
d). Carry out routine maintenance and reports on computer hardware and installations

1.0 ENTRY REQUIREMENTS
1.1 National Diploma

The entry requirements into National Diploma in Computer Engineering Technology are as follows:

a. Four credit level passes at SSCE or its equivalent at not more than two sittings. The four subjects must include Mathematics, Physics and any two other Science subjects. At least a pass in English Language is required.

b. A pass in an engineering trade and credit passes in Mathematics & Physics and one other subject in the National Technical certificate. Also a pass in English Language in NTCE is mandatory.
c. Four credit passes in an NBTE recognized preliminary ND course offered in a polytechnic or similar post secondary technical institution. The credit passes must include Mathematics, Physics and two science subjects. Candidates must in addition obtain at least a pass in English Language.

1.2 Higher national Diploma

The general entry requirements for the HND programme include:

a. All the requirement for admission into the ND programme;
b. Minimum of lower credit pass in the ND examination in Computer Technology or equivalent professional qualifications as approved by the NBTE
c. A minimum of one year cognate work experience;
d. In exceptional cases, ND diplomats with a pass in the ND examination that had two or more years of cognate experience in the specific field may be considered for admission into the HND programme.

## 2.0 CURRICULUM

2.1 The curriculum of the ND and HND programme consist of four main components for ND and three main area for HND;

(i) General studies/Education
(ii) Foundation courses
(iii) Professional courses
(iv) Supervised Industrial Work Experience Scheme (SIWES) (for ND only)

2.2 The general education components shall include courses in:

a). Art and Humanities – English Language, Communication. These are compulsory.
b). Social studies - Citizenship (the Nigerian Constitution) Economics,

Engineering in the Society, Industrial Management.

c). Political Science, Sociology, Philosophy, Geography, Entrepreneurship studies. The course in Citizenship is compulsory.

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

2.4 Foundation courses include courses in Mathematics, Pure Science, Technical drawing, descriptive geometry, statistics etc. The number of hours may account for about 25-35% of the total contact hours.

2.5 Professional courses are courses which give the student the theory and practical skill he needs to practice his field of calling at the technician/technologist level. These may account for between 60-70% of the contact hours.

2.6 Supervised 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 7.0

## 3.0 CURRICULUM STRUCTURE

### 3.1 ND Programme

The structure of the ND & HND programme consist of four semesters of classrooms, laboratory and workshop activities in the College – and a semester (3-4 months) of supervised Industrial Work Experience Scheme for ND. Each semester shall be of 17 weeks duration made up as follows:

15 contact weeks of teaching i.e. lecture, recitation and practical exercise, etc. and 2 weeks for tests, quizzes, examinations and registration. SIWES shall take at the end of the second semester of the first year for the ND programme.

## 4.0 ACCREDITATION

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

## 5.0 CONDITIONS FOR THE AWARD OF THE NATIONAL DIPLOMA

Institution offering accredited programmes will award the National Diploma (ND) or Higher National Diploma (HND) to candidates who successfully completed the programme after passing prescribed course work, examinations, diploma project and supervised industrial work experience. Such candidate should have completed a minimum of 72 and 80 semester credit units.

Diploma result shall be classified as follows:

| | | | | |
|---|---|---|---|---|
| Distinction | - | GPA of 3.50 | - | 4.00 |
| Upper Credit | - | GPA of 3.00 | - | 3.49 |
| Lower Credit | - | GPA of 2.50 | - | 2.99 |
| Pass | - | GPA of 2.00 | - | 2.49 |
| Fail | - | GPA of below | - | 2.00 |

## 6.0 GUIDANCE NOTES FOR TEACHERS TEACHING THE PROGRAMME

6.1 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.

6.2 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.

6.3 As the success of the credit unit system depends on the articulation of programmes between the institutions 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 aspect of the courses. These are a slight departure in the presentation of the performance. It is a deliberate attempt to further involve the staff of the department teaching the programme to write their own curriculum stating the condition existing in their institutions under which he performance can take place and to follow that with the criteria for determining an acceptable level of performance.

Departmental submission on the final curriculum may be vetted by the Academic Board of the institutions. Our aim is to continue to see to it so that a solid internal evaluation system exists in each institution for ensuring minimum standard and quality of education in the programmes offered throughout the Polytechnic system.

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

## 7.0 GUIDELINES ON SIWES PROGRAMME

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

**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 master list showing where each student has been placed shall be submitted to the Executive Secretary, NBTE who shall, in turn, authenticate the LIST and forward it to the Industrial Training Fund, Jos.

b) The placement officer should discuss 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 supervision 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 attachment should be weighted more on the evaluation by his industry – based supervisor.

7.2 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.

7.3 Grading of SIWES

To ensure uniformity of grading scales, the institution should ensure that the uniform grading of students' work which has been agreed to by all Polytechnics is adopted.

7.4 The Institution Based Supervisor

The institution based supervisor should initial the Log book 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.

7.5 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:

i. There is another visit six weeks after the first visit; and
ii. A final visit in the last month of the attachment.

7.6 Stipend 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.

7.7 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 is an 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

COMPUTER ENGINEERING TECHNOLOGY
NATIONAL DIPLOMA (ND) CURRICULUM TABLE

ND 1 SEMESTER 1

| S/N | CODE | COURSE TITLE | L | P | T | CU | CH |
|---|---|---|---|---|---|---|---|
| 1. | GNS 101 | Use of English | 2 | - | - | 2 | 2 |
| 2. | GNS 127 | Citizenship Education | 2 | - | - | 2 | 2 |
| 3. | MTH 112 | Algebra and Elementary Trigonometry | 2 | - | - | 2 | 2 |
| 4. | STA III | Introduction to Statistics | 2 | - | - | 2 | 2 |
| 5. | MEC 101 | Technical Drawing | 1 | 3 | - | 2 | 4 |
| 6. | MEC 107 | Mechanical Engineering Science | 2 | 3 | - | 3 | 5 |
| 7. | MEC 104 | Mechanical Workshop Tech. and Practice 1 | 1 | 3 | - | 2 | 4 |
| 8. | EEC 112 | Electrical Engineering Science | 2 | 3 | - | 3 | 5 |
| 9. | EEC 116 | Electrical Workshop Practice 1 | 1 | 3 | - | 2 | 4 |
| 10. | COM 111 | Introduction to Computer | 2 | - | - | 2 | 2 |
| TOTAL | | | 17 | 15 | - | 22 | 32 |

ND 1 SEMESTER 2

| S/N | CODE | COURSE TITLE | L | P | T | CU | CH |
|---|---|---|---|---|---|---|---|
| 1. | GNS 102 | Communication In English | 2 | - | - | 2 | 2 |
| 2. | GNS 125 | Economics | 2 | - | - | 2 | 2 |
| 3. | MTH 211 | Calculus | 2 | - | - | 2 | 2 |
| 4. | MEC 102 | Descriptive Geometry | 1 | 3 | - | 2 | 4 |
| 5. | MEC 108 | Introduction to Thermodynamics | 2 | - | - | 2 | 2 |
| 6. | EEC 124 | Electronics 1 | 2 | 3 | - | 3 | 5 |
| 7. | EEC 126 | Electrical Workshop Practice II | - | 3 | - | 1 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8. | EEC 128 | Electrical management and Instrumentation 1 | 2 | 3 | - | 3 | 5 |
| 9. | COM 122 | Computer Operations | 2 | - | - | 2 | 2 |
| 10. | COM 221 | Computer Programming (FORTRAN) | 2 | 3 | - | 3 | 5 |
| 11. | CTE 121 | Digital Computer Fundamentals 1 | 2 | - | - | 2 | 2 |
| TOTAL | | | 19 | 15 | - | 24 | 34 |

ND 2 SEMESTER 3

| S/N | CODE | COURSE TITLE | L | P | T | CU | CH |
|---|---|---|---|---|---|---|---|
| 1. | GNS 201 | Use of English II | 2 | - | - | 2 | 2 |
| 2. | MTH 202 | Logic and Linear Algebra | 2 | - | - | 2 | 2 |
| 3. | EEC 232 | Electrical Circuit Theory 1 | 2 | - | - | 2 | 2 |
| 4. | EEC 234 | Electronics II | 2 | 3 | - | 3 | 5 |
| 5. | EEC 235 | Electrical Measurement and Instrumentation II | 1 | 3 | - | 2 | 4 |
| 6. | EEC 237 | Electrical/Electronic Maintenance and Repair | 1 | 3 | - | 2 | 4 |
| 7. | CTE 211 | Micro Computer Fundamentals | 2 | 3 | - | 3 | 5 |
| 8. | CTE 212 | Computer Workshop Practice I | - | 3 | - | 1 | 3 |
| 9. | CTE 213 | Digital Computer Fundamentals II | 3 | 3 | - | 4 | 6 |
| 10. | CTE 214 | Computer Architecture | 1 | - | - | 1 | 1 |
| TOTAL | | | 16 | 18 | - | 22 | 34 |

ND 2 SEMESTER 4

| S/N | CODE | COURSE TITLE | L | P | T | CU | CH |
|---|---|---|---|---|---|---|---|
| 1. | GNS 202 | Communication In English II | 2 | - | - | 2 | 2 |
| 2. | MTH 122 | Trigonometry and Analytical Geometry | 2 | - | - | 2 | 2 |
| 3. | EEC 242 | Electrical Circuit Theory II | 2 | - | - | 2 | 2 |
| 4. | EEC 244 | Telecommunication Engineering | 2 | 3 | - | 3 | 5 |
| 5. | CTE 221 | Computer Programming (Assebly Lang.) | 1 | 3 | - | 2 | 4 |
| 6. | CTE 222 | Computer Workshop practice II | - | 3 | - | 1 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7. | CTE 223 | Operating Systems | 3 | - | - | 3 | 3 |
| 8. | CTE 224 | Computer Power Systems | 2 | - | - | 2 | 2 |
| 9. | CTE 225 | Project | - | - | 6 | 3 | 6 |
| TOTAL | | | 14 | 9 | 6 | 20 | 29 |

L = LECTURE HOURS
P = LABORATORY/PRACTICAL HOURS
T = TUTORIA HOURS
CU = COURSE UNIT
CH = CONTACT HOURS

COMPUTER ENGINEERING TECHNOLOGY
HIGHER NATIONAL DIPLOMA (HND) CURRICULUM TABLE

HND 1 SEMESTER 1

| S/N | CODE | COURSE TITLE | L | P | T | CU | CH |
|---|---|---|---|---|---|---|---|
| 1. | GNS 311 | Engineering Society | 2 | - | - | 2 | 2 |
| 2. | MTH 311 | Mathematics III (Advanced Algebra) | 2 | - | - | 2 | 2 |
| 3. | EEC 313 | Electrical Circuit Theory III | 2 | - | - | 2 | 2 |
| 4. | EEC 314 | Electrical Measurement and Instrumentation | 1 | 3 | - | 2 | 4 |
| 5. | EEE 315 | Electronic III | 2 | 3 | - | 3 | 5 |
| 6. | EEE 316 | Telecommunication II | 2 | 3 | - | 3 | 5 |
| 7. | BEE 317 | Electrical Design and Drafting | 1 | 3 | - | 2 | 4 |
| 8. | CTE 313 | Computer Programming, C programming | 1 | 3 | - | 2 | 4 |
| 9. | CTE 314 | Operating systems II | 2 | - | - | 2 | 2 |
| TOTAL | | | 15 | 15 | - | 20 | 30 |

HND 1 SEMESTER 2

| S/N | CODE | COURSE TITLE | L | P | T | CU | CH |
|---|---|---|---|---|---|---|---|
| 1. | GNS 302 | Communication in English III | 2 | - | - | 2 | 2 |
| 2. | GNS 421 | Industrial Management | 2 | - | - | 2 | 2 |
| 3. | MTH 312 | Mathematics (Advance Calculus) | 2 | - | - | 2 | 2 |
| 4. | COM 125 | Data Structure | 2 | - | - | 2 | 2 |
| 5. | COM 411 | Computer Application | 2 | 2 | - | 3 | 4 |
| 6. | EEC 323 | Electrical Circuit Theory IV | 2 | - | - | 2 | 2 |
| 7. | EEC 324 | Control Engineering I | 2 | - | - | 2 | 2 |
| 8. | CTE 321 | Computer Hardware System Design | 1 | 3 | - | 2 | 4 |
| 9. | EEE 325 | Electronics IV | 2 | 3 | - | 3 | 5 |
| 10. | EEC 328 | Testing Methods and Reliability | 2 | - | - | 2 | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TOTAL | | | 19 | 8 | - | 22 | 27 |

HND 2 SEMESTER 3

| S/N | CODE | COURSE TITLE | L | P | T | CU | CH |
|---|---|---|---|---|---|---|---|
| 1. | MTH 321 | Mathematics (Numerical Methods) | 2 | - | - | 2 | 2 |
| 2. | EEC 433 | Control Engineering II | 3 | - | 3 | 5 | 2 |
| 3. | CTE 410 | Computer Technology | 2 | 3 | - | 3 | 5 |
| 4. | CTE 411 | Data Communication and Computer Network | 2 | 3 | - | 3 | 5 |
| 5. | CTE 412 | Computer Architecture II | 2 | 3 | - | 3 | 2 |
| 6. | CTE 413 | Computer Installation and Maintenance | 1 | 3 | - | 2 | 4 |
| 7. | CTE 414 | Project I | - | - | 1 | 1 | 1 |
| TOTAL | | | 12 | 12 | 1 | 16 | 21 |

HND 2 SEMESTER 4

| S/N | CODE | COURSE TITLE | L | P | T | CU | CH |
|---|---|---|---|---|---|---|---|
| 1. | MTH 313 | Mathematics IV (Statistical Method) | 2 | - | - | 2 | 2 |
| 2. | COM 416 | Computer System Management | 2 | - | - | 2 | 2 |
| 3. | COM 421 | Computer Graphics | 2 | 3 | - | 3 | 5 |
| 4. | CTE 421 | Microprocessor in control and Instrumentation | 3 | 3 | - | 4 | 6 |
| 5. | CTE 422 | Artificial Intelligence | 2 | - | - | 2 | 2 |
| 6. | CTE 423 | Seminar | - | 3 | - | 1 | 3 |
| 7. | CTE 424 | Project II | - | - | 3 | 3 | 3 |
| TOTAL | | | 11 | 9 | 3 | 17 | 23 |

L = LECTURE HOURS
P = LABORATORY/PRACTICAL HOURS
T = TUTORIA HOURS
CU = COURSE UNIT

CH = CONTACT HOURS

# DRAWING AND MECHANICAL ENGINEERING COURSES

| | | |
|---|---|---|
| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: MEC 101** | **CREDIT HRS: 60 HRS** |
| **COURSE: TECHNICAL DRAWING** | **PRE-REQUISITE** | |
| **FIRST SEMESTER** | | |

**Goal:** This course is designed to acquaint the students with the fundamentals of technical drawing and their applications in engineering and technology.

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1. Know different drawing instruments, equipment and materials.
2. Understand the essentials in graphical communications.
3. Know the construction of simple geometrical figures and shapes.
4. Know the construction of isometric and oblique drawings and projection.
5. Understand the principles of orthographic projections.
6. Understand the intersections of irregular solids.

| **Theoretical Content** | | | | | | |
|---|---|---|---|---|---|---|
| **GENERAL OBJECTIVE 1:** know different drawing instruments, equipment and materials | | | | | | |
| **Week** | **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | |
| | 1.1 Identify the different types of drawing instruments, equipment and materials.<br>1.2 Outline the uses of the various instruments, equipment and materials<br>1.3 State the precautions necessary to preserve the items in 1.1 above<br>Maintain the various instruments and equipment. | | | | | |
| **GENERAL OBJECTIVE 2:** Understand the essentials in graphical communications | | | | | | |
| **Week** | 1 Explain graphics and the different types | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | of graphical presentations.<br>2.2 Illustrate the various conventional, representations in graphical productions of construction lines, finished lines, hidden and overhead details projections, centre lines, break lines, dimensioning of plane, elevations and sections of objects.<br>2.3 Layout drawing sheets with the following:<br>(a) margin Lines (b) title block, etc.<br>2.4 State the various standards of drawing sheets.<br>2.5 Print letters and figures of various forms and characters.<br>2.6 Illustrate conventional signs and symbols.<br>2.7 Layout a given set of drawing on a given sheet using the conventional signs, symbols and appropriate lettering characters | | | | | |
| **GENERAL OBJECTIVE 3:** Know the construction of simple geometrical figures and shapes | | | | | | |
| | 1 Explain the purpose of geometrical construction in drawings.<br>3.2 Construct parallel and perpendicular lines.<br>3.3 Construct bisect lines, angles and areas.<br>3.4 Dived a straight line into given number of equal parts.<br>3.5 Identify polygon (regular or irregular).<br>3.6 Construct regular polygon with (a) N sides in a given circle (b) a given side, length and N sides on a straight line<br>3.7 Define a circle.<br>3.8 Explain the properties of a circle, e.g. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | radius, diameter, normal, tangent, circumference etc.<br>3.9 Carry out simple geometrical constructions on circles. E.g.<br>a). The diameter of a circle given the circumference.<br>b). The circumference of a circle of a given diameter.<br>c). A circle to pass through 3 points.<br>d). A circle to pass through 2 points and touch a given line.<br>e). A circle to touch a given smaller circle and a given line.<br>f). Tangents to circle at various points<br>g). An arc of known radius tangent to two lines at an angle of less than and more than $90^0$<br>h). An arc externally tangent to two circles.<br>i). Inscribing/enscribing circles<br>3.10. Define an ellipse.<br>3.11. Construct an ellipse by using:<br>a). Trammel method.<br>b). Concentric circle method.<br>3.12. Explain the following draughting techniques:<br>a). Projection method.<br>b). Measurement method.<br>c). Transposition method. | | | | | |
| **GENERAL OBJECTIVE 4:** Know the construction of isometric and oblique drawing & projection | | | | | | |
| **Week** | 1 Explain isometric and oblique projections<br>4.2 Draw a square in isometric and oblique forms<br>4.3 Draw a circle in isometric and oblique forms | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 4.4 Draw an ellipse in isometric and oblique forms<br>4.5 Draw a polygon with a minimum of eight sides in isometric and oblique forms<br>4.6 Dimension holes, circles, arcs angles correctly on isometric and oblique drawing<br>4.7 Use appropriate conventional symbols and abbreviations. | | | | | |
| **GENERAL OBJECTIVE 5:** Understand the principles of orthographic projections | | | | | | |
| **Week** | 5.1 Explain the principles of orthographic projections.<br>5.2 Illustrate the principal planes of projection.<br>a). Vertical plane.<br>b). Horizontal plane.<br>5.3 Explain why the first and third angles are used and the second and fourth angles not used.<br>5.4 project views of three-dimensional objects on to the basic planes of projection in both first and third angle to obtain.<br>a). The front view or elevation<br>b). The top view or plan. | | | | | |
| **GENERAL OBJECTIVE 6:** Understand the intersections of irregular solids | | | | | | |
| | 6.1 Explain interpretation or intersections of solids<br>6.2 Draw the lines of inter-sections of solids following regular solids and planes in both first and third angles.<br>a). Two square prisms meeting at right angles.<br>b). Two dissimilar square prism at right angles. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | c). A hexagonal prism meeting a square prism at right angles.<br>d). Two dissimilar cylinders meeting at angle.<br>e). Two dissimilar cylinder meeting at right angle.<br>f). Two dissimilar cylinder meeting at right angles. Their centre not being in the same vertical plane. | | | | | |

| | | |
|---|---|---|
| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: MEC 102** | **CREDIT HRS: 60 HRS** |
| **COURSE: DESCRIPTIVE GEOMETRY** | **PRE-REQUISITE MEC 101** | |
| **FIRST SEMESTER** | | |

**Goal:** This course is designed to develop the student's skill in descriptive geometry and application of graphical technique.

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1. Know the construction of different geometrical figures and shapes.
2. Understand orthographic projections.
3. Understand the developments and intersections of regular solids and planes.

**Theoretical Content**

**GENERAL OBJECTIVES 1:** Know the construction of different geometrical figures and shapes

| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
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| 1.1 Carry out simple geometric construction of an ellipse e.g.<br>a). Tangent to an ellipse at any given on the ellipse, tangent an ellipse from a given point P outside the ellipse etc.<br>1.2 Dived areas of plane figure.<br>1.3 Enlarge and reduce from the given areas of plane figure.<br>1.4 Define parabola and hyperbola.<br>1.5 Construct parabola and hyperbola using:<br>a). Rectangular method;<br>b). Ordinate method;<br>c). Tangent method; | | | | | | |

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| d). Offset method.<br>1.6 Locate the directrix and focus of a given parabolic curve.<br>1.7 Construct a curve of a parabolic form through two given points.<br>1.8 Define locus of a point.<br>1.9 Define involute to a square, circle, cycloid and Archimedean spiral.<br>1.10 Construct involute to a square, circle cycloid and Archimedean spiral.<br>1.11 Describe the various types of link mechanism.<br>1.12. Plot the locus of a point e.g.<br>a). Mechanism with a link, constrained to pass through a fixed point.<br>b). Mechanism with the end of the link constrained to move in a horizontal line.<br>c). Three links mechanism.<br>d). Linkages of a mechanically operated level system.<br>e). Mechanism of a printing press. | | | | | | |

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| f). Mechanism of a pair of secatours. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand orthographic projections | | | | | | |
| 2.1 Identify the third plane (the auxiliary or side vertical plane) of projection.<br>2.2 Project on the end view of a three dimensional object.<br>2.3 Sketch from an object (with chamfer, round hole, stepped block, etc) the plan and elevators and draw the sketched view in first and third angle orthographic projection.<br>2.4 Draw plan, elevators and section of a simple object such as hollow sandcrete block<br>2.5 Explain the properties of a point, a line and a plane in space.<br>2.6 Locate given points, lines and planes in space on the projection planes.<br>2.7 Determine the true length of a line in space using:<br>a). Auxiliary method.<br>b). Rotational method.<br>2.8 State practical applications of the methods in 2.7. | | | | | | |

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| 2.9 Apply successive auxiliary projections to determine:<br>a). The true position of a point to both horizontal and vertical planes.<br>b). The true length of line inclined to both horizontal and vertical planes.<br>c). The true shape of a plane inclined to both horizontal and vertical planes.<br>d). The shortest distance between two lines to the planes.<br>e). The angle of inclination of a line inclined to two given planes.<br>2.10 Explain dihedral angle and give examples of where it is commonly used; hipped roofs, hoppers etc.<br>2.11Determine dihedral angle of two intersecting surfaces. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the developments and intersections of regular solids and planes. | | | | | | |
| 3.1 Define developments<br>3.2 Develop patterns of regular solids such as truncated prism, circular cylinder, truncated | | | | | | |

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| cylinder, frustrum of a pyramid, truncated cone etc.<br>3.3 Draw the lines of intersections of the following regular solids and planes in both first and third angles:<br>a). A cylinder meeting a square pyramids at right angle.<br>b). A cylinder meeting a square pyramids at an angle.<br>c). A cylinder meeting a cone, the cone at an angle.<br>d). A cylinder meeting a cone, the cone enveloping the cylinder.<br>e). A cylinder and a cone, the cylinder enveloping the cone.<br>f). A square prism meeting a rectangular plane at an angle.<br>g). A square prism meeting an ellipse at an angle.<br>h). A square prism meeting a circle an angle.<br>i). A cylinder meeting a pentagon at an angle.<br>j). A cylinder meeting an | | | | | | |

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| ellipse at an angle.<br>k). A cone meeting an ellipse at an angle.<br>l). A circle cutting through a pyramid at an angle.<br>m). An ellipse being enveloped by a pyramid at an angle etc.<br>3.4 Draw the patterns (developments) of the regular solids and planes in 3.3 above.<br>3.5 Make models of the patterns referred to 3.3 above. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: MEC 104** | **CREDIT HRS: 60 HRS** |
| **COURSE: MECHANICAL WORKSHOP TECHNOLOGY AND PRACTICE 1** | | |
| **FIRST SEMESTER** | | |

**Goal:** This course is intended with basic practical skills in mechanical engineering practice.

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1. Know the hazards in a workshop environment and the appropriate procedure to take in the event of an accident in a workshop.
2. Know the composition, properties, choice and use of a range of Engineering materials.
3. Understand the general principles of cutting and the application of various cutting tools.
4. Demonstrate the knowledge of the use of common measuring and marking-out instruments.
5. Know the functions and uses of a drilling machine and a center lathe.
6. Know the functions and use of shaping and milling machines.

**Theoretical Content**

**GENERAL OBJECTIVES 1:** Know the hazards in a workshop environment and the appropriate procedure to take in the event of an accident in a workshop.

| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
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| 1.1 List the major responsibilities of the employee under the health and safety at work "Act"<br>1.2 Identify the dangers associated with unsuitable clothing, hair, and the importance of machine guards.<br>1.3 List the dangers associated with the improper use of electricity in the workshop.<br>1.4 State the need for eye | | | | | | |

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| protection in relation to sparks, dust, etc.<br>1.5 Identify hazardous conditions covered by the "ACT" in 1.1 above.<br>1.6 State the relevant procedures to be taken to deal successfully with various types of fire and accident: oil, electrical, mechanical and chemical.<br>1.7 List the procedures to be taken in the event of physical injury.<br>1.8 List the procedures for the care and use of various workshop tools and machines.<br>1.9 State the power requirements for most workshop power machines. | | | | | | |
| **GENERAL OBJECTIVES 2:** Know the composition, properties, choice and uses of a range of Engineering materials | | | | | | |
| 2.1 State the properties and the uses of plain carbon steels, malleable, cast, and wrought irons.<br>2.2 State the properties and the uses of plain brasses and bronzes, nickel and nickel-chrome constructional steel.<br>2.3 Describe the properties of light alloys, metals used for diecasting, | | | | | | |

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| bearing metals and their uses.<br>2.4 List plastic materials in common use, their advantages and limitations compared with metals.<br>2.5 State the typical uses of plastic materials. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the general principles of cutting and the application of various cutting tools | | | | | | |
| 3.1 Describe the general principles of filling and identify grades of files (Rough file, dead file, smooth file).<br>3.2 Identify the features of twist drills, reamers, taps dies and tapering tools.<br>3.3 State the reasons for using cutting fluids.<br>3.4 Select suitable fluid for various cutting operations.<br>3.5 Estimate suitable speeds and feeds for common metal-cutting operations | | | | | | |
| **GENERAL OBJECTIVES 4:** Demonstrate the knowledge of the use of common measuring and marking-out instruments. | | | | | | |
| 4.1 Use correct, rules dividers, odd-legs centre punch protractors vee blocks, etc<br>4.2 Explain the principle of non-digital 1 micrometer.<br>4.3 Explain the principle of the Vernier protractor, | | | | | | |

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| micrometer and their common applications.<br>4.4 Demonstrate the use of the instrument in 4.1 to 4.3. | | | | | | |
| **GENERAL OBJECTIVES 5:** Know the functions and uses of a drilling machine and a center lathe | | | | | | |
| 5.1 Identify the features of drilling machine centre lathe.<br>5.2 Differentiate between various types of drilling machines and their uses.<br>5.3 Use drilling machine to drill holes to a specified depth.<br>5.4 Position accurately work on the face plate.<br>5.5 Describe three methods of taper turning<br>5.6 Fix taper turning attachments.<br>5.7 Carry out exercise using drilling and lathe machine. | | | | | | |
| **GENERAL OBJECTIVES 6:** Know the functions and uses of shaping and milling machines. | | | | | | |
| 6.1 State the process of shaping.<br>6.2 List the basic motion of tool on the work piece.<br>6.3 Explain briefly the following:<br>a). Reciprocating motion of tool;<br>b). Feed motion for horizontal surfaces;<br>c). Feed motion for | | | | | | |

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| vertical surfaces;<br>d). Feed motion for inclined surfaces<br>6.4 Describe the various parts of the shaping machine.<br>6.5 Explain the following methods of alignment testing:<br>a). Parallelism<br>b). Squareness<br>6.6 List methods of holding a work-piece in the machine.<br>6.7 Describe various parts of the milling machine.<br>6.8 List various types of milling machine.<br>6.9 Explain briefly cutting and feed motions.<br>6.10 Explain machine alignment.<br>6.11 Describe methods of holding a workpiece.<br>6.12 Describe various cutting tools used in the milling process.<br>6.13 Carry out exercises using the shaping and milling machines. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: MEC 107** | **CREDIT HRS: 75 HRS** |
| **COURSE: MECHANICAL ENGINEERING SCIENCE** | **COURSES UNIT 3.0** | |
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| **Goal:** This course is designed to provide the student with basic knowledge in statics and dynamics material, mechanic and operation of simple machines | | |

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1. Understand the concept of statics and solve problems associated with it.
2. Understand the concept of dynamics and solve problems related to it.
3. Understand the concept of frictional forces and solve related problems.
4. Understand the concept of work, power and energy and solve problems involving them.
5. Understand the principles of simple machines.
6. Understand the concept of stress and strain.
7. Understand the effects of pressure due to static fluids.
8. Know the properties of fluids and solve problems involving them
9. Understand and apply the principles of fluid flow.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the concept of statics and solve problems associated with it. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | | | | **Learning Resources** | |
| 1.1 Differentiate between scalar vector quantities.<br>1.2 Computer the addition and subtraction vectors<br>1.3 Resolve vectors.<br>1.4 Define force.<br>1.5 Determine magnitude and line of action of force.<br>1.6 Represent force by | | | | | | |

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| vectors.<br>1.7 Describe concept of equilibrium and triangle of forces.<br>1.8 Resolve force both analytically and graphically.<br>1.9 Define coplanar and concurrent forces.<br>1.10 Define the effects of force and moment of a force.<br>1.11 Determine resultant and equilibrant of forces.<br>1.12 Define couple.<br>1.13 Draw polygon of forces.<br>1.14 Determine by experiment using the force board to verify.<br>a). Triangle of forces.<br>b). Parallelogram of forces.<br>1.15 Construct the following using universal mechanic kits:<br>a). Parallelogram of forces;<br>b). Moment of forces;<br>c). Parallel force on beam.<br>1.16 Define centre of gravity.<br>1.17 Determine centre of gravity of at least 3 | | | | | | |

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| different bodies.<br>1.18 Determine centre of area of a lamina.<br>1.19 Determine centroid.<br>1.20 Describe type of support, joints, and reactions.<br>1.21 Determine internal forces on a member.<br>1.22 Explain the equilibrium of forces at a pin joint.<br>1.23 Draw force diagram for a frame structure.<br>1.24 Explain the redundant member in a frame structure.<br>1.25 Solve simple problems relating to 1.2 to 1.24.<br>1.26 Verify by experiment the following:<br>i. Principle of moments;<br>ii. Centre of gravity of plane figures.<br>1.27 Demonstrate the following by experiment, using moment of couple apparatus:<br>i. Equilibrium of parallel forces.<br>ii. Equilibrium of moments and<br>iii. Equilibrium of couples | | | | | | |

| GENERAL OBJECTIVES 2: Understand the concept of dynamics and solve problems related to it. | | | | | | |
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| 2.1 Differentiate between linear and angular motion.<br>2.2 Define speed, velocity and acceleration.<br>2.3 Define torque.<br>2.4 Explain linear displacement, angular displacement, linear and angular velocity and acceleration.<br>2.5 Plot speed time graph.<br>2.6 Derive equations of motion of a body having constant acceleration.<br>2.7 Solve problem involving 2.2 to 2.6.<br>2.8 Explain displacement and velocity as vector quantities.<br>2.9 Describe change of velocity.<br>2.10 Determine resultant displacement and resultant velocity.<br>2.11 Verify by experiment the equation of linear motion.<br>2.12 Derive equation of motion of freely falling bodies.<br>2.13 State Newton's laws of motion.<br>2.14 Describe principle of conservation of | | | | | | |

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| energy.<br>2.15 Determine potential and Kinetic energy by calculation.<br>2.16 Define momentum and energy.<br>2,17 Explain impulse forces.<br>2.18 Determine Kinetic energy of rotation.<br>2.19 Explain centripetal and centrifugal forces.<br>2.20 State the application of 2.18 to 2.19.<br>2.21 Perform an experiment to verify that centrifugal forces vary with mass, speed and distance. | | | | | | |
| GENERAL OBJECTIVES 3: Understand the concept of frictional forces and solve related problems. | | | | | | |
| 3.1 Explain friction.<br>3.2 State laws of friction.<br>3.3 Determine angle of friction and total reaction.<br>3.4 Differentiate between static and dynamic friction.<br>3.5 State merits and demerits of frictional forces.<br>3.6 Solve problems involving 3.2 to 3.4<br>3.7 Perform experiment using the screw jaw, to determine the following: a). Friction force. | | | | | | |

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| b). Velocity ratio, mechanical advantage and efficiency.<br>3.8 Perform experiment using friction apparatus:<br>a). To determine coefficient of frictions<br>b). To verify the law of friction | | | | | | |
| GENERAL OBJECTIVES 4: Understand the concept of work, power and energy and solve problems involving them. | | | | | | |
| 4.1 Define work, power, energy and their unit.<br>4.2 Determine work done and power transmitted by a torque.<br>4.3 Solve problems involving work, power and energy.<br>4.4 Determine by experiment torque, speed and energy and solve problems involving them. | | | | | | |
| GENERAL OBJECTIVES 5: Understand the principles of simple machines. | | | | | | |
| 5.1 Define a machine.<br>5.2 State the law of machine.<br>5.3 Define mechanical advantage, velocity ratio<br>5.4 Plot load-mechanical advantage graph.<br>5.5 State the formula for the efficiency of a machine. | | | | | | |

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| 5.6 Give examples of simple machines.<br>5.7 Explain the operation of differential wheel and axle.<br>5.8 Describe screw jack.<br>5.9 Explain the operation of a simple gear train.<br>5.10 Explain the operation of compound gear train.<br>5.11 Explain the operation of worm and worm wheel.<br>5.12 Explain the operation of belt drives<br>5.13 Solve problems involving 5.3 to 5.12<br>5.14 Demonstrate differential pulley system of load lifting. | | | | | | |
| GENERAL OBJECTIVE 6: Understand the concept of stress and strain. | | | | | | |
| 6.1 Define load.<br>6.2 Relate load and deformation.<br>6.3 Describe elastic and plastic ranges.<br>6.4 Define tensile, comprehensive, and shear stress and strain.<br>6.5 Relate stress and strain<br>6.6 State Hooke's law.<br>6.7 Perform tensile test for mild steel.<br>6.8 Determine ultimate tensile and comprehensive stress. | | | | | | |

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| 6.9 Define Ductility.<br>6.10 Plot load-extension diagrams for nonferrous materials.<br>6.11 Explain shear and shear stress.<br>6.12 Describe proof stress and brittle fracture.<br>6.13 Explain shearing cause by punching of flat plate.<br>6.14 Explain simple riveted and bolted joints.<br>6.15 Explain temperature stress.<br>6.16 Explain bending moments.<br>6.17 Solve simple problems involving 6.2 to 6.16<br>6.18 Explain poisons ratio. | | | | | | |
| GENERAL OBJECTIVES 7: Understand the effects of pressure due to static fluids. | | | | | | |
| 7.1 Define pressure.<br>7.2 State the unit of pressure.<br>7.3 Determine hydrostatic pressure.<br>7.4 Derive the formula for the pressure at any depth of a liquid.<br>7.5 Describe instrument used for pressure measurements.<br>7.6 State the sources of errors in manometers.<br>7.7 Describe pressure gauges. | | | | | | |

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| 7.8 State sources of errors in pressure gauge.<br>7.9 Describe pressure transducers.<br>7.10 Explain Archimedes principle.<br>7.11 Solve problems involving hydrostatic pressure.<br>7.12 Verify by an experiment the Archimedes principle. | | | | | | |
| GENERAL OBJECTIVES 8: Know the properties of fluids and solve problems involving them. | | | | | | |
| 8.1 State properties of fluids.<br>8.2 Explain the difference between compressible and incompressible fluids.<br>8.3 Define density, specific weight and specific gravity.<br>8.4 State the application units of quantities in 8.3.<br>8.5 Solve problems involving 8.3<br>8.6 Explain viscosity. | | | | | | |
| GENERAL OBJECTIVES 9: Understand and apply the principles of fluid flow | | | | | | |
| 9.1 Explain fluid flow and volume, and rate of flow.<br>9.2 Derive the equation of continuity of flow.<br>9.3 Explain Kinematic viscosity.<br>9.4 Derive an expression for | | | | | | |

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| the energy of a moving liquid.<br>9.5 Explain the momentum of a fluid<br>9.6 Explain total specific energy.<br>9.7 Derive an expression for the total head of a liquid.<br>9.8 Derive an expression for the Kinetic energy of a jet of fluid.<br>9.9 Explain the effects of impact of jet on vertical stationary and moving flat plates, moving curved and inclined plates.<br>9.10 State areas of application of fluid flow e.g. turbines and punips.<br>9.11 Solve problems involving 9.2 to 9.8.<br>9.12 Determine by experiment the rate of flow of liquids. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: MEC 108** | **CREDIT HRS: 75 HRS** |
| **COURSE: INTRODUCTION TO THEMODYNAMICS** | **COURSES UNIT 3.0** | |
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**Goal:** This course is designed to enable the student acquire the basic knowledge of thermodynamic principles and their applications in engineering.

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1. Understand and apply the basic principles of Thermodynamics.
2. Understand the different types of Thermodynamics processes.
3. Understand the basic principles of heat engines and standard cycles.
4. Know the basic properties of different quality steams using the steam tables.
5. Know different types of fuels and their compositions.
6. Understand the different types of heat transfer and laws governing them.
7. Understand the principle and the use of air conditions and refrigeration.
8. Understand the effect of vibration on machine elements.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand and apply the basic principles of Thermodynamics. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | | **Learning Resources** | | | |
| 1.1 Define thermodynamics<br>1.2 List the different thermodynamic media and their properties.<br>1.3 Identify the internal energy of gasses<br>1.4 Compare the two specific heats.<br>1.5 Find the ratio of 1.4 | | | | | | |

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| above in the form m=Cp/Cv.<br>1.6 State Boyle's law and Charles's law for gasses.<br>1.7 Derive the characteristic equation of gasses i.e. $PV^2 = MRT$.<br>1.8 Solve problems involving change of pressure, volume and temperature for ideal gasses.<br>1.9 State the first law of thermodynamics.<br>1.10 State the relationship between heat transfer (Q), Work Transfer (W) and elated changes in the properties of the working substance or system.<br>1.11 Derive the energy equation i.e. Heat supplied – Work done + changes in internal energy.<br>1.12 Solve problem involving first law of thermodynamics. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand the different types of Thermodynamic processes | | | | | | |
| 2.1 Explain the constant volume process.<br>2.2 Show that the work done is equal to zero. | | | | | | |

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| 2.3 Explain constant volume process.<br>2.4 Show that the work done = change in internal energy and heat added.<br>2.5 Explain constant temperature process and determine the work done. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the basic principles of heat engines and standard cycles. | | | | | | |
| 3.1 State the second law of Thermodynamics.<br>3.2 Define heat engine as device which uses 2 thermal reservoir as a source and sink in order to deliver work output on a continuous basis.<br>3.3 Explain the Carnot cycle.<br>3.4 Illustrate Carnot cycle with the aid of a P.V. diagram.<br>3.5 Point out the limitations and assumptions made in 3.3.<br>3.6 Determine the efficiency of the Carnot cycle using 3.3.<br>3.7 Describe Otto cycle with the aid of PV diagram.<br>3.8 Determine the efficiency of the Otto cycle using 3.6 above. | | | | | | |

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| 3.9 Point out the limitations and assumptions made in 3.6.<br>3.10 Explain the Diesel cycle.<br>3.11 Compare the PV diagram of the diesel cycle with the Otto cycle.<br>3.12 Calculate the efficiency of the diesel cycle.<br>3.13 Explain the dual cycle.<br>3.14 Compare the PV diagram with that of the Diesel and the Otto cycles.<br>3.15 Describe the rankine cycle.<br>3.16 Draw the line diagram of a steam power plant<br>3.17 Define internal combustion and external combustion engines.<br>3.18 List the classes of heat engine according to:-<br>i. The position of combustion;<br>ii. The methods of combustion;<br>iii. Type of cooling;<br>iv. Type of fuel used;<br>v. The position of the combustion chamber, i.e. horizontal, vertical | | | | | | |

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| or vee;<br>vi. Type of movement i.e. reciprocating or rotary.<br>3.19 List the parts of an external combustion engine.<br>3.20 List the parts of an external combustion (I.C) engine<br>3.21 Explain the function of carburetor, distributor and spark plug.<br>3.22 Describe the fuel injection in a diesel plant.<br>3.23 Describe the fuel strokes in a 4-strokes engine<br>3.24 Illustrate the PV diagram and the value timing diagram.<br>3.25 Describe the 2 stroke engine.<br>3.26 Differentiate between 4 stroke and 2 stroke engine.<br>3.27 Explain the application of 4 stroke and 2 stroke engine.<br>3.28 Describe the I.C Engine power plant.<br>3.29 Describe the gas turbines power plant. | | | | | | |
| **GENERAL OBJECTIVES 4:** Know the basic properties of different quality steams using the steam tables. | | | | | | |
| 4.1 Define gas and vapour. | | | | | | |

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| 4.2 Describe the generation of steam at constant pressure.<br>4.3 Draw the temperature-enthalpy diagram to Illustrate the properties of steam.<br>4.4 Explain sensible heat, latent heat and degree of super heat.<br>4.5 Differentiate between dry, saturated and wet saturated steam.<br>4.6 Determine dryness fraction.<br>4.7 Determine the properties of steam using steam table.<br>4.8 Solve basic problem related to different quality steam.<br>4.9 Define Dalton's Law of partial pressures.<br>4.10 Describe the steam calorimeter.<br>4.11 Determine the quality of wet steam using the steam calorimeter. | | | | | | |
| **GENERAL OBJECTIVES 5:** Know different types of fuels and their compositions. | | | | | | |
| 5.1 List typical solid, liquid and gaseous fuels and their sources.<br>5.2 State the chemical composition of fuels.<br>5.3 Define complete, incomplete and | | | | | | |

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| stoichiometric combustion.<br>5.4 Evaluate the theoretical quality of air required in 5.3<br>5.5 define air fuel ratio, rich mixture, lean mixture and mixture strength.<br>5.6 Define gross (higher) and net (lower) calorific values.<br>5.7 Determine the calorific values of fuels using Dulong's formula.<br>5.8 Describe a method for the determination of the composition of an exhaust gas. | | | | | | |
| **GENERAL OBJECTIVES 6:** Understand the different types of heat transfer and the laws governing them | | | | | | |
| 6.1 Define heat transfer across the boundaries of a system.<br>6.2 Describe the 3 methods of heat transfer as conduction, convection and radiation.<br>6.3 State Fouries Law of conduction<br>6.4 State Newton's Law of cooling.<br>6.5 Describe heat exchangers and their practical application.<br>6.6 Explain natural and forced convention.<br>6.7 Determine Reynold's | | | | | | |

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| number<br>6.8 Explain black body radiation and grey body radiation<br>6.9 Define the Stetan-Boltzmen Law for the emissive power of a black body. | | | | | | |
| **GENERAL OBJECTIVES 7:** Understand the principle and the use of air conditions and refrigeration. | | | | | | |
| 7.1 Define air conditioning.<br>7.2 State the role of air conditioning in modern life<br>7.3 Illustrate dry bulb and wet bulb temperature.<br>7.4 Define the terms specific humidity, relative humidity and ideal psychometrics.<br>7.5 Plot 7.4 on a psychometric chart.<br>7.6 Explain how an air conditioner works.<br>7.7 List the common types of refrigeration systems<br>7.8 Identify refrigerators as reversed heat engines.<br>7.9 List the refrigerants used in the system.<br>7.10 Explain how a refrigerator works. | | | | | | |
| **GENERAL OBJECTIVES 8:** Understand the effect of vibration on machine elements. | | | | | | |
| 8.1 Define mechanical vibration.<br>8.2 Compare damped and undamped vibrations. | | | | | | |

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| 8.3 Explain forced vibration<br>8.4 Describe linear vibration.<br>8.5 Determine stiffness of materials.<br>8.6 Explain the rotation of a shaft between bearing<br>8.7 Explain whirling of shaft.<br>8.8 Explain self excited vibrations. | | | | | | |

# ELECTRICAL AND ELCTRONIC COURSES

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: EEC 112** | **CREDIT HRS: 75 HRS** |
| **COURSE: ELECTRICAL ENGINEERING SCIENCE** | **COURSES UNIT 3.0** | |
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**Goal:** This course is intended to provide the student 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 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.
5. Understand the concept of magnetism and magnetic circuits.
6. Understand the concept of electromagnetism and electromagnetic induction.
7. Understand the concept of inductance and its application.
8. Understand the fundamentals of A.C. theory.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the concept of electric current flow. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | | **Learning Resources** | | | |
| 1.1 Define an atom<br>1.2 Explain the structure and composition of an atom.<br>1.3 Differentiate between conductors, insulators and semi-conductors.<br>1.4 Explain the concepts of current and electron flow.<br>1.5 Define electric current, | | | | | | |

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| potential difference electromotive force (e.m.f) and resistance, state their units and symbols.<br>1.6 State multiples and sub-multiples of Electric quantities; (e.g. Mega-m-$10^6$, kilo-k-$10^3$, etc). | | | | | | |
| GENERAL OBJECTIVES 2: Understand simple d.c. circuits | | | | | | |
| 2.1 Define d.c. current.<br>2.2 State the analogy between current-flow, and water flow.<br>2.3 Describe basic d.c. circuits.<br>2.4 Explain ohm's law.<br>2.5 verify by experiment the ohm's law.<br>2.6 Solve problem using ohm's law.<br>2.7 Define resistivity and conductivity of a conductor.<br>2.8 State the relationship between resistance of a conductor, its resistivity, length and area.<br>2.9 Verify by experiment the resistivity of a material.<br>2.10 Differentiate between series and parallel circuits.<br>2.11 Solve problems involving resistivity | | | | | | |

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| and conductivity<br>2.12 Deduce the equivalent resistance of series and parallel circuits.<br>2.13 Explain Kirchhoff's laws.<br>2.14 Verify by experiment the kirchoff's laws.<br>2.15 Explain the super position principles.<br>2.16 Solve problems involving series and parallel circuits using kirchff's laws and superposition principles.<br>2.17 Define temperature coefficient of resistance.<br>2.18 Use the expression for resistance at temperature $T^0$k and to $O^0$k to calculate changes in resistance.<br>2.19 Draw the graph of resistance against Temperature.<br>2.20 Deduce from 2.18 the change in resistance due to change in temperature.<br>2.21 Determine by experiment the heating effect of electric current.<br>2.22 Solve problems involving effect of | | | | | | |

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| temperature on resistance. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand various types of energy and their inter-relationship | | | | | | |
| 3.1 Explain various types of energy.<br>3.2 Explain the relationship between electrical, mechanical and thermal energy.<br>3.3 State S.I. units of various types of energy in 3.2.<br>3.4 State Joule' law.<br>3.5 Solve problems involving Joule's law.<br>3.6 Determine by experiment power in a d.c. circuit. | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand the concept of electrostatics, electric change and capacitance of capacitors. | | | | | | |
| 4.1 Explain electric charge.<br>4.2 State its unit.<br>4.3 State coulomb's law capacitors.<br>4.4 Solve problems involving coulomb's law.<br>4.5 Define electric field strength, electric flux density, permittivity, relative permitity, field intensity, potential and electric flux.<br>4.6 Solve problems involving the terms in 4.5.<br>4.7 Define capacitance.<br>4.8 Derive an expression for | | | | | | |

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| the capacitance of parallel plate capacitors in terms of area, the distance between plates and composite dielectrics.<br>4.9 Derive an expression for the capacitance of a capacitor with composite dielectric.<br>4.10 Derive an expression for the voltage distribution between series connected capacitors.<br>4.11 Deduce an expression for the equivalent capacitance for capacitors connected in series and in parallel.<br>4.12 Derive an expression for the energy stored in a capacitor.<br>4.13 Solve problems involving 4.8 to 4.12.<br>4.14 Determine by experiments charging and discharging on a capacitor. | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand the concept of magnetism and magnetic circuits | | | | | | |
| 5.1 Define magnetic flux, magnetic flux density magneto motive force, magnetic field strength, reluctance, permeability of free space magnetic | | | | | | |

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| constants relative permeability.<br>5.2 State the symbols, units and relationships of terms in 5.1.<br>5.3 Draw the electrical equivalent of magnetic circuit with or without air-gap.<br>5.4 State analogies between electrical and magnetic circuits.<br>5.5 Solve simple magnetic circuit problems.<br>5.6 Distinguish between soft and hard magnetic materials. | | | | | | |
| **GENERAL OBJECTIVES 6:** Understand the concept of electromagnetism and electromagnetic induction | | | | | | |
| 6.1 Explain the magnetic affect of electric current.<br>6.2 Draw magnetic fields around straight conductors, adjacent parallel conductors and solenoids.<br>6.3 Demonstrate by experiment the magnetic effect of a current carrying conductor in a magnetic field.<br>6.4 Explain the force on a current carrying conductor in a magnetic field.<br>6.5 State the direction of the force in 6.4 | | | | | | |

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| 6.6 Derive the expression for the magnitude of the force in 6.4 (i.e F = mBIL newton).<br>6.7 Explain the concept of electromagnetic induction.<br>6.8 State Faraday's Laws of electromagnetic induction.<br>6.9 State Lenz's law of electromagnetic induction.<br>6.10 Derive the expressions for magnitude of e.m.f induced in a conductor or a coil.<br>6.11 Solve problems involving 6.6 to 6.10 above.<br>6.12 State the applications of electromagnetic induction.<br>6.13 Verify by experiments Faraday's & Lenz's laws | | | | | | |
| **GENERAL OBJECTIVES 7:** Understand the concept of inductance and its application | | | | | | |
| 7.1 Define self and mutual inductances.<br>7.2 State the symbols and units of the terms in 7.1 above.<br>7.3 State the expression for the equivalent inductance of inductances connected in series and in parallel. | | | | | | |

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| 7.4 State the expression for the induced voltage across an inductor.<br>7.5 State the expression for the inductance in inductive coupled coils connected in series aiding or opposing.<br>7.6 Derive an expression for energy stored in an inductor.<br>7.7 Solve problem involving 7.3 to 7.6.<br>7.8 Describe using suitable diagram the operation of the induction coiled in a car ignition system.<br>7.9 Determine by experiment the inductance of a coil.<br>7.10 Determine by experiment energy loss in an inductor. | | | | | | |
| GENERAL OBJECTIVES 8: Understand the fundamentals of A.C theory | | | | | | |
| 8.1 Describe the production of alternating e.m.f by a rotating coil in a magnetic field.<br>8.2 Sketch a.c. waveforms both to scale and not to scale.<br>8.3 Define r.m.s. instantaneous, average, and peak valves, period, frequency of an a.c. waveform. | | | | | | |

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| 8.4 State relationship between instantaneous and peak values of a sinusoidal wave.<br>8.5 Solve problems involving 8.2 to 8.4.<br>8.6 Solve problems graphically on a.c. circuits with different combinations of resistance, inductance and capacitance.<br>8.7 Differentiate between series parallel resonance.<br>8.8 Explain phase lag or phase lead as applied to a.c circuits.<br>8.9 Explain the difference between single-phase and three-phase supply.<br>8.10 State advantages and disadvantages of three phase supply over single phase supply.<br>8.11 Demonstrate by experiment the relationship between the following frequency, period and amplitude of sinusoidal wave.<br>8.12 Determine by experiment the Q-factor of circuit containing R,L, and C in (a) series, (b) parallel. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: EEC 116** | **CREDIT HRS: 60 HRS** |
| **COURSE: ELECTRICAL WORKSHOP PRACTICE 1** | **COURSES UNIT 2.0** | |
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**Goal:** This course is designed to enable the student acquire basic skill necessary for Electrical installation work.

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1. Understand the applications of wiring and safety regulations.
2. Knows the use of electrical and electronic engineering tools and equipment.
3. Understand the construction and uses of different types of cables and the regulations relating to their uses.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the applications of wiring and safety regulations | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 List the main cause of hazards in electrical and electronic engineering.<br>1.2 Explain methods of preventing hazards.<br>1.3 State briefly the scope and purpose of the health and safety at work e.t.c. Act 1974, the IEE wiring regulation ($15^{th}$ Edition) the 1937 electricity supply regulation and the 1908 and 1944 factories act | | | | | | |

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| Regulation and Nigerian standard organization.<br>1.4 List several important considerations concerning general safety of Electrical and Electronic equipment and apparatus.<br>1.5 Define earth continuity conductor, earth electrode consumer's earth terminal.<br>1.6 Explain the necessity for earthing and state the relevant regulation concerning earthing.<br>1.7 Explain the protection of an installation by fuse and by ELCB.<br>1.8 Distinguish between solid earthing practice and earth leakage circuit breaker protection.<br>1.9 State a number of problems associated with earth leakage circuit breakers.<br>1.10 Describe how the human body can become part of an electric circuit.<br>1.11 Explain how to prevent electric shock.<br>1.12 Explain the methods of treating electric shock<br>1.13 Demonstrate (Artificial | | | | | | |

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| respiration).<br>i. Mouth resuscitation;<br>ii. Revised Holder Nelson resuscitation;<br>iii. External cardio compression/cardiopulmonary resuscitation<br>1.14 Identify common burns and wounds.<br>1.15 Administer first aid applicable to 1.14.<br>1.16 List and use different types of fire extinguisher.<br>1.17 Explain when each in 1.14 is applicable. | | | | | | |
| **GENERAL OBJECTIVES 2:** Know the use of electrical and electronic engineering tools and equipment. | | | | | | |
| 2.1 List the tools obtainable inside an electrician's toolbox.<br>2.2 Explain the use of electrical workshop tools<br>2.3 Describe procedure for carrying out routine inspection of hand tools.<br>2.4 Distinguish between a hand tool and a machine tool.<br>2.5 Explain the correct method of lighting blow lamps.<br>2.6 Light blow lamps correctly.<br>2.7 Use common workshops | | | | | | |

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| tools and equipments for the desired effect. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the construction and uses of different types of cables and the regulations relating to their uses. | | | | | | |
| 3.1 List the main types of insulating and conducting materials.<br>3.2 Distinguish between conductors and insulators.<br>3.3 Describe, with the aid of sketches, the construction of different types of cables.<br>3.4 State the advantages and disadvantages when using:<br>i. P.V.C- insulated, P.V.C -sheated cables.<br>ii. Minerals-Insulated metal-sheated cables.<br>iii. Armoured P.V.C-Insulated, PVC sheated cables.<br>iv. Steel and PVC conducts.<br>v. Steel and PVC trunking.<br>vi. Flexible cable and cord etc.<br>3.5 Explain the general IEE Regulation related to cables and their uses.<br>3.6 Identify the cable colour coding, commonly used | | | | | | |

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| in Nigeria.<br>3.7 Perform various types of joints PVC and flexible cables. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: EEC 124** | **CREDIT HRS: 75 HRS** |
| **COURSE: ELECTRONICS 1** | **COURSES UNIT 3.0** | |
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**Goal:** This course is intended the student 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 an I.C.
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 a field-effect transistor (FET)

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the concept of thermionic emission. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Explain the phenomenon of thermionic emissions.<br>1.2 Explain electron flow in a diode valve.<br>1.3 Sketch the diode valve characteristics<br>1.4 Obtain d.c and a.c resistance from 1.3<br>1.5 Explain half-wave and full-wave rectification.<br>1.6 Explain the construction and principles of operations of a triode | | | | | | |

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| valve.<br>1.7 Determine by experiment the anode characteristics of a triode valve.<br>1.8 Draw the characteristics in 1.7 above<br>1.9 Draw typical family curves of la/vg (output characteristics).<br>1.10 Draw typical family curves of la/vg (mutual characteristics).<br>1.11 Define and determine the anode slope resistance. (r) Mutual conductance (gm) and amplification factor; (/u).<br>1.12 Explain the effect of inter-electrode capacitances in a triode valve.<br>1.13 Explain the construction and principles of operation of: Triode and Pentode.<br>1.14 Determine by experiment the characteristics of valves listed in 1.13<br>1.15 Draw the characteristics of valves in 1.13.<br>1.16 Explain the negative resistance effect in a triode. | | | | | | |

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| **GENERAL OBJECTIVES 2:** Understand the simple concept of energy level in materials | | | | | | |
| 2.1 Outline energy levels in materials.<br>2.2 Explain valence and conduction bands.<br>2.3 Explain Fermi energy levels.<br>2.4 Distinguish between conductors, semiconductors and insulators, using Fermi-level concept.<br>2.5 Explain intrinsic and extrinsic semiconductors.<br>2.6 Explain carriers in semi-conductors.<br>2.7 Define majority and minority carries.<br>2.8 Outline the effect of temperature on the conductivity of semi-conductors and conductors. | | | | | | |
| **GENERAL OBJECTIVES 3:** Know the operations, characteristics and applications of semi-conductor devices. | | | | | | |
| 3.1 Explain P-N junction diode (Forward and Reverse bias).<br>3.2 Sketch forward and reverse characteristics of the P-N junction diode.<br>3.3 Explain silicon and Germanium diode characteristics.<br>3.4 Explain zener diode characteristics. | | | | | | |

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| 3.5 Identify the circuit symbols for diode.<br>3.6 Identify various types of diodes physically.<br>3.7 Explain the following:<br>i. The zener effect, and<br>ii. Avalanche effect.<br>3.8 State application of zener diode (clipping, stabilization etc.)<br>3.9 Explain the operation, using the characteristics and symbol of the following:<br>i. Tunnel diode.<br>ii. Photo diode.<br>iii. Thermistors.<br>3.10 State the applications of (1) to (3) in 3.9 above. | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand the constructional features and configuration of an I.C | | | | | | |
| 4.1 Explain the structure and operation of a bipolar transistor (NPN and PNP).<br>4.2 Explain the biasing arrangement of NPN and PNP bipolar transistors.<br>4.3 Explain the circuit configuration of NPN and PNP bipolar transistors and their biasing arrangement:<br>i. The common base configuration.<br>ii. The common | | | | | | |

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| collector configuration.<br>iii. The common emitter configuration.<br>4.4 Sketch the static characteristics curves of NPN and PNP bipolar transistors for 4.3 (i) and 4.3 (iii).<br>4.5 Determine the input and output resistances, current and voltage gains from 4.4.<br>4.6 Determine by experiments the characteristic curve of NPN and PNP transistors. | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand how the triode and the bipolar transistor can be used as a single stage amplifier | | | | | | |
| 5.1 Explain the fixed biasing arrangement of a single state transistor amplifier.<br>5.2 Explain how to draw the load line (D.C & A.C.) output characteristic curve of a bipolar transistor.<br>5.3 Explain how to use the characteristic curves to determine the following:<br>i. A.C current gain;<br>ii. A.C. Voltage gain<br>iii. A.C. Power gain<br>5.4 Draw the load line (D.C and A.C) on output | | | | | | |

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| characteristic of a triode amplifier.<br>5.5 Explain the working principles of a triode amplifier.<br>5.6 Determine by experiment the voltage gain of a common emitter. | | | | | | |
| **GENERAL OBJECTIVES 6:** Understand the zener diode and thyristor as switching devices. | | | | | | |
| 6.1 Explain basic structure of the thyristor and the zener diode.<br>6.2 Explain the working principle of the thyristors and the zener diode.<br>6.3 List the application of the thyristor and the zener diode.<br>6.4 State the advantages of the thyristor switch over other types of electromechanical switches e.g. relay mechanical switches.<br>6.5 Explain the operation of zener diode as voltage stabilizer.<br>6.6 Verify by experiment the operation of a zener diode as a voltage stabilizer. | | | | | | |
| **GENERAL OBJECTIVES 7:** Understand the constructional features and operation of a field-effect transistor (FET) | | | | | | |
| 7.1 Explain the basic constructional features | | | | | | |

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| of FET's (junction gate and insulated v gate).<br>7.2 Explain the different between depletion and data.<br>7.3 Plot the output and transfer characteristics from given data.<br>7.4 Determine ra, gm and u from 7.3.<br>7.5 State the precautions necessary when using FET's.<br>7.6 Determine by experiment, the output characteristic of a common source FET.<br>7.7 Obtain voltage gain, input and output resistance from output characteristic in 7.6 above.<br>7.8 Compare the properties of a FET with that of a triode valves and bipolar transistors.<br>7.9 Explain the use of bipolar and FET as switching devices using characteristics curves. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: EEC 126** | **CREDIT HRS: 45 HRS** |
| **COURSE: ELECTRICAL WORKSHOP PRACTICE II** | **COURSES UNIT 1:0** | |
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**Goal:** This course is designed to enable the students acquire the knowledge and skill in Electrical Installation practice.

**GENERAL OBJECTIVES:**
On completion of this module, the student should be able to:
1. Understand various electrical wiring systems of equipment and accessories and the regulation relating to them.
2. Understand the testing and inspection of electrical installations.
3. Know the various soldering techniques.
4. Know the installation of electrical motors and starters.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand various electrical wiring systems of equipment and accessories and the regulation relating to them. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Identify different wiring methods such as conduits, ducts, trunking and surface.<br>1.2 Prepare item in 1.1 above for the regulation relating various installations.<br>1.3 State factors associated with the choice of a particular wiring system.<br>1.4 State the uses of wooden blocks and pattresses for electrical wiring.<br>1.5 Install electrical | | | | | | |

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| accessories such as plugs, adaptor, ceiling roses, sockets switches etc. using them in 1.1 above.<br>1.6 Wire 2, 2-way switches with two intermediate switches to control various lighting points.<br>1.7 i. Wire electrical bell, bell-indicator and alarm circuits, ELCB, domestic ring main circuit cooker control unit, consumer control unit and discharge lamps.<br>ii. Distribute power in a consumer premises employing single phase four wire systems.<br>1.8 State the regulation relating to 1.4 to 1.6 above<br>1.9 Prepare requisition for wiring materials. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand the testing and inspection of electrical installations | | | | | | |
| 2.1 State the basic requirements for testing and inspection of electrical installation.<br>2.2 Draw the electrical diagrams of testing procedures.<br>2.3 Name various instruments for carrying | | | | | | |

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| out testing and inspection work.<br>2.4 Carry out the following test:<br>i. Verification of polarity;<br>ii. Continuity test;<br>iii. Insulation resistance test;<br>iv. Test of ring circuit continuity;<br>v. Test of effectiveness of earthing.<br>2.5 Locate faults in cables using:<br>i. Bridge methods, and<br>ii. Murray loop teat. | | | | | | |
| **GENERAL OBJECTIVES 3:** Know the various soldering techniques. | | | | | | |
| 3.1 Identify three soldering equipment:<br>i. Soldering iron (light duty).<br>ii. Tinman's soldering iron (heavy duty).<br>iii. Pot and ladle.<br>3.2 Explain the correct usage of soldering equipment in 3.1 above.<br>3.3 Perform soldering exercise, using the appropriate tools, equipment and materials. | | | | | | |
| **GENERAL OBJECTIVES 4:** Know the installation of electrical motors and starters. | | | | | | |
| 4.1 Prepare mounts for motors, generators or | | | | | | |

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| transforms.<br>4.2 Prepare and terminate cables on to the above machines.<br>4.3 Wire electric motors using:<br>i. Direct-on-line starters;<br>ii. Auto transformer starter;<br>iii. Star-delta starter.<br>4.4 Test motor armature and stator windings.<br>4.5 Test machines for effectiveness. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: EEC 128** | **CREDIT HRS: 5 HRS** |
| **COURSE: ELECT MEASUREMENT & INSTRUMENTATION I** | **COURSES UNIT 3.0** | |
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**Goal:** This is intend to provide the student with the basic knowledge and skill in measurement and measuring instruments.

**GENERAL OBJECTIVES:**

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** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Know the various types of indicating instruments. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Identify various electromechanical and electronic instruments.<br>1.2 Explain the typical applications of electromechanical and electronic instruments. | | | | | | |
| **GENERAL OBJECTIVES 2:** Know the basic structure of an electromechanical instrument. | | | | | | |
| 2.1 State the common devices used in an electromechanical instrument e.g Deflection, Controlling | | | | | | |

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| and Damping devices.<br>2.2 Describe the types of controlling devices i.e spring control and gravity control.<br>2.3 Describe the methods of damping e.g.<br>i. Eddy current damping.<br>ii. Air viscous damping.<br>iii. Oil viscous damping.<br>2.4 Describe the three basic deflecting systems used in electromechanical instruments.<br>i. Permanent magnet-moving coil d'Arsonval<br>ii. Moving iron system.<br>iii. Electrodynamics' system. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the operation and construction of a permanent magnetic-moving coil instrument. | | | | | | |
| 3.1 Explain with sketches the operation of a permanent-magnet moving coil instrument (P.M.M) using contrawound and spring control.<br>3.2 Describe permanent-magnet moving coil ammeters and voltmeters.<br>3.3 Explain the use of shunts and multipliers with ammeters and voltmeters to extend the | | | | | | |

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| ranges.<br>3.4 Explain the limitations of the simple p.m.m in measuring high values of voltage and currents.<br>3.5 Calculate the value of the multiplier and shunt resistance for a given application.<br>3.6 Calibrate by experiments electro-dynamic ammeter, voltmeter and wattmeter.<br>3.7 Describe the operation of instrument transformers. | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand the construction and principle of operation of ohmmeter, merger and multimeters | | | | | | |
| 4.1 Describe with the aid of diagram the construction of ohmmeter and megger.<br>4.2 Explain the operation of ohmmeter and megger<br>4.3 Measure resistance using ohmmeters and meggers. | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand the use of potentiometer for the measurement of electrical quantities in d.c and a.c circuits. | | | | | | |
| 5.1 Describe the slide wire potentiometer.<br>5.2 Explain the method of standardization using potentiometer.<br>5.3 Describe the measurement of low resistance, and voltage using potentiometer. | | | | | | |

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| 5.4 Describe the calibration of ammeter and voltmeter using a potentiometer.<br>5.5 Describe the commercial type of d.c. potentiometer.<br>5.6 Measure voltage using slide wire potentiometer. | | | | | | |
| **GENERAL OBJECTIVES 6:** Understand the theory of errors in measurement and its applications. | | | | | | |
| 6.1 State different types of errors (random systematic errors).<br>6.2 Define random and systematic errors.<br>6.3 Give examples of each of errors in 6.2.<br>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. | | | | | | |
| **GENERAL OBJECTIVES 7:** Understand the construction, principles of operation and use of cathode ray oscilloscope (CRO). | | | | | | |
| 7.1 Draw a simplified block diagram of a C.R.O<br>7.2 Explain the function of each blocks in 7.1:<br>i. Cathode ray tube;<br>ii. Vertical and horizontal amplifiers;<br>iii. Time-base trigger block;<br>iv. Sweep generator | | | | | | |

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| blocks;<br>v. Signal delay block;<br>vi. Sweep delay block.<br>7.3 Draw well labeled diagram of a cathode ray tube.<br>7.4 Explain the function of each parts of the cathode ray tube.<br>7.5 Explain how C.R.O can be used to measure:<br>i. d. c. voltage.<br>ii. a.c voltage.<br>iii. Infrequency of sinusoidal waveform.<br>7.6 Explain the use of probes to get the best possible signal on the scope.<br>7.7 Measure voltage, frequency and amplitude of a.c and d.c using C.R.O | | | | | | |

| PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING | CODE: EEC 232 | CREDIT HRS: 30 HRS |
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| COURSE: ELECTRICAL CIRCUIT THEORY I | COURSES UNIT 2.0 | |
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**Goal:** This course is intended to provide the 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** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the Kirchhoff's laws and their application in solving d.c electrical problems. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Explain Kirchhoff's voltage and current laws.<br>1.2 Derive formulae for series and parallel circuit with respect to total current and voltage drop.<br>1.3 Solve problems on Kirchhoff's laws. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand a.c theory and apply it to the solution of simple electrical circuits. | | | | | | |
| 2.1 State different mathematical forms of representing a.c. signal e.g. trigonometry polar | | | | | | |

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| and j-notation.<br>2.2 Convert a.c. signal in polar form to the j-notation.<br>2.3 Subtract, add, multiply and divide phasor using j-operator.<br>2.4 Solve simple problems using j-notation.<br>2.5 Draw to scale phasor diagrams for a.c. circuits.<br>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.<br>2.7 Distinguish between inductive and capacitive reactance.<br>2.8 Draw voltage and current wave forms on same axis to show lagging and leading angles.<br>2.9 Draw the phasor diagrams for series and parallel a.c. circuits.<br>2.10 Calculate voltage, current power and power factor in series and parallel circuits.<br>2.11 Explain series and parallel resource. | | | | | | |

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| 2.12 State conditions for series and parallel resource.<br>2.13 Prove the relevant formulae for 2.12 above e.g. q-factor, dynamic impedance, bandwidth, resonance frequency.<br>2.14 Sketch I and Z against F for series and parallel circuits where I=current, Z= impedance, F= frequency.<br>2.15 Calculate the Q-factor for a coil; loss factor for a capacitor.<br>2.16 Explain, with the aid of a diagram, bandwidth.<br>2.17 Solve problems involving bandwidth and circuit Q-factor. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand Mesh and Nodal analyses and their applications in solving electrical problems. | | | | | | |
| 3.1 Explain the following terms used in electric network:<br>i. Active element/circuit e.g. battery/circuit containing a battery etc.<br>ii. Passive Element/circuit e.g. resistor/a source less circuit.<br>iii. Branch.<br>iv. Node. | | | | | | |

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| v. Loop;<br>vi. Network.<br>3.2 Explain the basic principle of melh circuit analysis.<br>3.3 Solve problem on items listed in 3.2 above.<br>3.4 Explain the basic principle of Nodal analysis.<br>3.5 Solve problem on 3.4 above. | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand Network transformation and Duality principles. | | | | | | |
| 4.1 Reduce a complex network to its series or parallel equivalent.<br>4.2 Identify star and delta networks.<br>4.3 Derive the formula for transformation of a delta to a star network and vice-versa.<br>4.4 Solve problems on 4.3 above.<br>4.5 Explain the meaning of Duality principle.<br>4.6 Establish duality between resistance, conductance, in ductance, capacitance, voltage-current.<br>4.7 Fine the dual of network.<br>4.8 Solve network problems using duality principle | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand Network theorems and their applications d.c and a.c circuits. | | | | | | |

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| 5.1 State Thevenin's Theorem.<br>5.2 Explain the basic principle of Thevenin's theorem.<br>5.3 Solve problems on simple networks using Thevenin's theorem.<br>5.4 Solve problems involving repeated use of Thevenin's theorem.<br>5.5 State Norton's Theorem.<br>5.6 Explain the basic principle of Norton's Theorem.<br>5.7 Compare Norton's theorem with Thevenin's theorem.<br>5.8 Solve problem using Norton's theorem.<br>5.9 State millman's theorem.<br>5.10 Explain the basic principle of millman's theorem.<br>5.11 Solve network problems using millman's theorem.<br>5.12 State reciprocity theorem.<br>5.13 Explain the basic principle of reciprocity theorem.<br>5.14 Solve network problems using Reciprocity theorem. | | | | | | |

| PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING | CODE: EEC 234 | CREDIT HRS: 75 HRS |
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| COURSE: ELECTRONIC II | COURSES UNIT 3.0 | |
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**Goal:** This course is intended to enable the student acquire the basic knowledge of 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. Understand and 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** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the operation of signal amplifiers. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Explain different types of biasing arrangement of transistor amplifier.<br>i. Fixed bias.<br>ii. Collector-base bias without and with a decoupling capacitor.<br>iii. Potential divider bias.<br>iv. Junction FET simple bias. | | | | | | |

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| 1.2 Draw the circuit diagram of a single stage common emitter and source transistor amplifiers having resistive load, transformer and tuned circuit loads.<br>1.3 Calculate the voltage and power gains of the amplifiers in 1.2 above.<br>1.4 Explain the principle of operation of the circuit in 1.2 above.<br>1.5 Explain the principles and methods of interstage coupling:<br>i. Resistance-capacitive coupling.<br>ii. Direct coupling<br>iii. Transformer coupling.<br>1.6 List the application of the different coupling methods.<br>1.7 Explain with a sketch, the frequency response of the coupling methods in 1.5.<br>1.8 Explain the biasing conditions for classes A,B, AB, and C amplifiers.<br>1.9 List the main applications of each type of amplifier in 1.8 | | | | | | |

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| above.<br>1.10 Explain the operation of simple push-pull amplifier :<br>i. Transformer-coupled.<br>ii. Transformer less coupling.<br>1.11 Determine by experiments the performance of amplifiers using different biasing methods.<br>1.12 Determine by experiment the gain/frequency curve of a transistor amplifier. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand the general principles of feedback and oscillators. | | | | | | |
| 2.1 Draw the block diagram of a basic feedback amplifier.<br>2.2 Define positive and negative feedback in amplifiers.<br>2.3 Explain the general expression for stage gain of a basic feedback amplifier.<br>2.4 State the effect of applying negative feedback to an amplifier in relation to:<br>i. Gain.<br>ii. Gain stability.<br>iii. Bandwidth.<br>iv. Distortion. | | | | | | |

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| v. Noise.<br>vi. Input and output resistance.<br>2.5 Explain how oscillations can be produced by an amplifier with positive feedback.<br>2.6 Explain the operation of:<br>i. R- oscillator.<br>ii. L-C oscillator (Hartley & colpitts)<br>2.7 Describe methods of employing frequency stability of oscillators e.g. piezo-electric crystal control etc.<br>2.8 Determine by experience the effect applying in negative feedback to an amplifier in relation to the items listed in 2.4 above.<br>2.9 Determine by experiment the operation of:<br>R-C oscillator<br>L-C oscillator (Hartley and coipitts) | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand and apply the principles of switching circuits. | | | | | | |
| 3.1 Explain the characteristics of switch.<br>3.2 Explain with aid of switches thee principle of operation of the following multivibrators<br>i. Bistable. | | | | | | |

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| ii. Monostable<br>iii. Astable. | | | | | | |
| **GENERAL OBJECTIVES 4:** Know the action of basic electronic logic gates. | | | | | | |
| 4.1 Explain the operation of the following electronic logic gates using appropriate symbols and truth-table:<br>i. The 'NOT' gate or inventers;<br>ii. The 'AND' gate;<br>iii. The 'OR' gate;<br>iv. The 'AND' gate<br>v. The 'NOR' gate | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand the basic circuits used in power supplies. | | | | | | |
| 5.1 Explain with sketches half-wave and full-wave rectification and calculate ripple factors.<br>5.2 Describe with diagrams the operation of a bridge rectifier.<br>5.3 Explain the use of the following as smoothing circuits:<br>i. The capacitor input filter.<br>ii. The inductance input filter.<br>5.4 Explain the action of a stabilized power supply using:<br>i. Zener diode.<br>ii. Series regulator.<br>iii. Shunt regular.<br>5.5 Demonstrate by | | | | | | |

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| experiments:<br>i. Half-wave rectification;<br>ii. Full-wave rectification. | | | | | | |

| PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING | CODE: EEC 235 | CREDIT HRS: 60 HRS |
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| COURSE: ELECTRICAL MEASUREMENT & INSTRUMENTATION II | **COURSES UNIT 2.0** | |
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**Goal:** This course is intended to enable the student 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. Understand the use of different types of meters for measuring power and power factor.
2. Understand the 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** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the use of different types of meters for measuring power and power factor. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Explain the electrodynamics principles of different types of power measurement.<br>1.2 Describe the operation of electrodynamics wattmeter and power factor meter.<br>1.3 Explain the induction principle of power measurement.<br>1.4 Describe the induction | | | | | | |

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| wattmeter.<br>1.5 Describe the use of two wattmeter for power measurement in a 3 phase circuit.<br>1.6 Measure Power in:<br>a. Single phase circuit;<br>b. 3 phase circuit, using wattmeter and p.f. meters | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand the use of different types of bridges (a.c. and d.c.). | | | | | | |
| 2.1 Explain the term null indicator.<br>2.2 Describe the expression for the measurement of an unknown resistance by Wheatstone bridge circuit.<br>2.3 Derive the expression for the measurement of an unknown resistance by Wheatstone bridge circuit.<br>2.4 Describe the Carey Foster's slide wire bridge.<br>2.5 Explain, how a.c. bridge can be used to measure;<br>i. Resistance;<br>ii. Inductance;<br>iii. Capacitance;<br>iv. Frequency<br>2.6 Measure the items listed in 2.5 above. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the principle of operation of a fluxmeter and its application. | | | | | | |
| 3.1 Describe the | | | | | | |

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| constructional features of a fluxmeter.<br>3.2 Explain the principle of operation of a fluxmeter.<br>3.3 Explain the use of a fluxmeter for drawing B H curves.<br>3.4 Determine by experiments the B.H curves for different magnetic materials using a flux meter. | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand the principle and use of digital instruments. | | | | | | |
| 4.1 Explain with aid of block diagram the working principles of a digital voltmeter and ammeter.<br>4.2 Explain how the DVM can be used to measure:<br>a. Voltage;<br>b. Current;<br>c. Resistance.<br>4.3 State the limitations of the DVM for measuring high frequency signals.<br>4.4 Explain with aid of a bock diagram, the working principle of a digital frequency meter.<br>4.5 State advantages of digital meters over other electromechanical measuring instruments.<br>4.6 Measure Voltage, current and frequency using digital instruments. | | | | | | |

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| **GENERAL OBJECTIVES 5:** Know the various factors which should be considered when selecting an instrument. | | | | | | |
| 5.1 Explain the importance of the factors using the following factors in selecting instruments for measurement<br>i. Range.<br>ii. Accuracy.<br>iii. Response.<br>iv. Input.<br>v. Stability.<br>vi. Operation.<br>vii. Reliability.<br>viii. Sensitivity. | | | | | | |
| **GENERAL OBJECTIVES 6:** Understand the main types of measurements and measuring instruments. | | | | | | |
| 6.1 Explain instrumentation and its importance.<br>6.2 Explain the working principles and uses of the following instruments:<br>a. Indicating instrument;<br>b. Recording instrument;<br>c. Controlling instruments<br>6.3 Differentiate the instruments stated in 6.2 above, giving example of each.<br>6.4 Calibrate each types of instrument in 6.2 | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | **CODE: EEC 237** | **CREDIT HRS: 60 HRS** |
| **COURSE: ELECTRICAL/ ELECTRONIC MAINTENANCE AND REPAIRS** | **COURSES UNIT 2.0** | |
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**Goal:** This course is intended to provide the student with practical skills in maintenance and repairs of electrical/electronic 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 and apply jointing soldering and desoldering techniques.
3. Know different circuit components
4. Understand the use of manufactures service manual and circuit wiring diagrams.
5. Know the maintenance of domestic and industrial equipment.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the general use of tools and testing instruments. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Identify the following testing instrument and tools.<br>i. Multi-tester;<br>ii. Transistor tester;<br>iii. Bearing extractor;<br>iv. Line vice;<br>v. Oil strength tester;<br>vi. Oscilloscope;<br>vii. Electronic voltmeter instruments.<br>1.2 Explain the uses of the items of 1.1 | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand and apply jointing soldering and desoldering techniques. | | | | | | |
| 2.1 Outline cabling | | | | | | |

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| procedure and practice.<br>2.2 Explain the following:<br>a. Jointing techniques;<br>b. Soldering techniques;<br>c. Crimping and fastening method.<br>2.3 Explain disordering procedure and techniques.<br>2.4 Demonstrate the procedure and techniques in 2.2.<br>2.5 Demonstrate the procedure in 2.3.<br>2.6 Solder simple circuits.<br>2.7 Carry out joints of different types of cables. | | | | | | |
| **GENERAL OBJECTIVES 3:** Know different circuit components | | | | | | |
| 3.1 Identify the values of resistors and capacitors using colour codes.<br>3.2 List different types of resistors (carbon, wire-wound, ketal oxide etc. and capacitors.<br>3.3 Identify resistors by their preferred values and power rating.<br>3.4 Identify capacitors by their working voltage and types.<br>3.5 Identify the symbols of the following common electrical/electronic components.<br>i. Transistors; | | | | | | |

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| ii. Diodes;<br>iii. Thyristors;<br>iv. Integrated circuit (IC's);<br>v. Disc;<br>vi. Triac.<br>3.6 Identify various types of transformers (current, voltage-isolation and autotransformers).<br>3.7 Explain open-circuit and short-circuit defects in components.<br>3.8 Outline various methods of testing components:<br>a. In-circuit.<br>b. Out of circuit.<br>3.9 Wire up component to make simple electrical/electronic circuits. | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand the use of manufactures service manual and circuit wiring diagrams. | | | | | | |
| 4.1 Discuss circuit tracing.<br>4.2 Outline trouble shooting and fault isolating techniques.<br>4.3 List observation test method:<br>i. Visual;<br>ii. Touch;<br>iii. Smell;<br>iv. Hearing.<br>4.4 Explain d.c and a.c signal testing.<br>4.5 Identify the module by measurement (voltage | | | | | | |

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| and resistance test).<br>4.6 Explain stage or module by substitution.<br>4.7 Identify faulty components by measurement (voltage and resistance test). Replace faulty components. | | | | | | |
| **GENERAL OBJECTIVES 5:** Know the maintenance of domestic and industrial equipment. | | | | | | |
| 5.1 Explain the maintenance of batteries and battery-chargers; and acid handling.<br>5.2 Explain the method of trouble shooting and repair of the following household appliances:<br>i. Electrical fans;<br>ii. Electrical washing machines;<br>iii. Refrigerators;<br>iv. Air conditioners;<br>v. Electric iron, cooker, kettle;<br>vi. Electrical heater etc.<br>5.3 Explain trouble shooting and repairs of<br>i. a.c. generator.<br>ii. A.c. motor;<br>iii. Electric sound system.<br>5.4 Explain maintenance | | | | | | |

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| and testing of transformers.<br>5.5 Carry out the maintenance of the items mentioned in 5.2 to 5.4 above. | | | | | | |

| PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING | CODE: EEC 242 | CREDIT HRS: 30 HRS |
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| COURSE: ELECTRICAL CIRCUIT THEORY II | COURSES UNIT 2.0 | |
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**Goal:** This course is intended to enable the student 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. Understand the basic principles involved in three-phase system and their applications.
3. Understand and apply time domain analysis of RC, RL and RLC circuits.
4. Understand the magnetic coupling phenomena.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the principles of power calculation in a.c. circuits. | | | | | | |
| **Specific Learning Outcomes** | | | **Teacher's Activities** | **Learning Resources** | | |
| 1.1 Calculate power in A.C circuit containing:<br>i. Resistance;<br>ii. Inductance;<br>iii. Capacitance;<br>iv. Combinations of<br>1.2 Explain power factor and factors affecting its value.<br>1.3 Explain the following:<br>i. Apparent power;<br>ii. Reactive power;<br>iii. Active power.<br>1.4 Explain methods of power factor correction.<br>1.5 Solve problems on power factor, active | | | | | | |

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| power, apparent power, reactive power and power factor correction. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand the basic principles involved in three-phase system and their applications. | | | | | | |
| 2.1 Define polyphase system.<br>2.2 Explain the basic different between single phase and three-phase systems.<br>2.3 Explain the phase sequence of a three-phase system.<br>2.4 State the advantages of 3-phase circuits.<br>2.5 Explain how 3-phase emf are produced.<br>2.6 Distinguish between star and delta 3-phase system.<br>2.7 Derive the relationship between line and phase values of voltages and current in a star and delta connected windings.<br>2.8 Derive an expression for power in 3-phase circuit (balance and unbalanced)<br>2.9 Explain the 2-wattmeter and single-wattmeter methods of measuring 3-phase power.<br>2.10 Solve problems on 2.5 to 2.9 | | | | | | |

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| **GENERAL OBJECTIVES 3:** Understand and apply time domain analysis of RC, RL and RLC circuits. | | | | | | |
| 3.1 Explain the meaning of transients.<br>3.2 Sketch the growth and decay curves in RC circuits.<br>3.3 Derive formulae for current & voltage growths and decay in RC ircuits.<br>3.4 Define time constant.<br>3.5 Explain time constant in RC circuits.<br>3.6 Derive expression for the growth and decay of voltage and current in RL circuits.<br>3.7 Sketch curve for growth and decay of current and voltage in RL circuits. | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand the magnetic coupling phenomena. | | | | | | |
| 4.1 Describe magnetic coupling.<br>4.2 Define mutual inductance.<br>4.3 Determine the polarity of coupled coils.<br>4.4 Define coefficient of coupling.<br>4.5 Define an equivalent circuit for magnetically coupled coils.<br>4.6 Define an ideal transformer.<br>4.7 Use 4.5 to derive an equivalent circuit of an | | | | | | |

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| ideal transformer.<br>4.8 Explain with the aid of sketches, an equivalent circuit of a practical transformer. | | | | | | |

| PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING | CODE: EEC 244 | CREDIT HRS: 75 HRS |
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| COURSE: TELECOMMUNICATION ENGINEERING | COURSES UNIT 3.0 | |
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**Goal:** This course is intended to enable the student acquire basic knowledge of telecommunication engineering principles.

**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 and demodulation.
3. Understand the basic principles of modulation and demodulation.
4. Know the principles of radio and black/white T.V transmission.
5. Understand the principles of radio and black white television receptions.
6. Understand the basic working principles of telephone and telegraph systems.
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

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the basic principles of telecommunication systems. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Draw the block diagram of a simple communication system showing:<br>i. Input transducer;<br>ii. Transmitter;<br>iii. Transmission channel;<br>iv. Receivers;<br>v. Output transducer.<br>1.2 Explain the function of the blocks listed in 1.1 | | | | | | |

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| **GENERAL OBJECTIVES 2:** Understand the principles of operation and application and demodulation. | | | | | | |
| 2.1 Describe sound transducers:<br>i. Microphones.<br>ii. Loud speaker's application of various.<br>2.2 Explain, with the aid of diagrams the principles of operation and uses of:<br>i. Carbon microphone;<br>ii. Crystal microphone;<br>iii. Moving coil loudspeaker;<br>iv. capacitor microphone. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the basic principles of modulation and demodulation. | | | | | | |
| 3.1 Explain the significance of modulation and demodulation in communication systems.<br>3.2 Explain the following modulation processes:<br>i. Amplitude modulation;<br>ii. Frequency modulation.<br>3.3 Explain the following regarding amplitude modulation:<br>i. Side frequencies;<br>ii. Side band;<br>iii. Modulation evelope;<br>iv. Bandwidth.<br>3.4 Solve problems | | | | | | |

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| involving the following:<br>i. Modulation index;<br>ii. Bandwidth.<br>3.5 Explain the following terms regarding frequency modulation:<br>i. Modulation index;<br>ii. Deviation ratio;<br>iii. Frequency deviation;<br>iv. System deviation;<br>v. Frequency swing.<br>3.6 Explain why F.M. has a wider bandwidth than A.M.<br>3.7 Compare the parameters of F.M. with A.M.<br>3.8 Solve problems involving 3.6 and 3.7 above.<br>3.9 Explain the working principles of amplitude demodulator.<br>3.10Explain the working principles of frequency demodulation.<br>3.11 Determine by experiments the amplitude modulation and demodulation of telecommunication system.<br>3.12 Determine by experiments the frequency modulation and demodulation of | | | | | | |

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| telecommunication system | | | | | | |
| **GENERAL OBJECTIVES 4:** Know the principles of radio and black/white T.V transmission | | | | | | |
| 4.1 Draw block diagrams of the following radio transmitters using:<br>i. Amplitude modulation;<br>ii. Frequency modulation.<br>4.2 Explain the function of each block in 4.1.<br>4.3 Draw the block diagram of a television transmitter (black & white).<br>4.4 Explain the function of each block in 4.3<br>4.5 Explain how vision and sound signals are generated separately and transmitted together.<br>4.6 Perform an experiment on superheterodyne receiver. | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand the principles of radio and black white television receptions | | | | | | |
| 5.1 Draw the block diagram of the following radio receivers:<br>i. Straight;<br>ii. Superheterodyne.<br>5.2 Explain the function of each block diagram in 5.1.<br>5.3 Explain the choice of intermediate frequency | | | | | | |

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| in the superheterodyne receiver.<br>5.4 Explain the following phenomena in superheterodyne receiver:<br>i. Adjacent channel interference;<br>ii. Image interference;<br>iii. Intermediate frequency (I.F) breakthrough.<br>5.5 Explain the use of double superhet to suppress image and adjacent channel interferences.<br>5.6 Explain the function of the automatic gain control (A.G.C).<br>5.7 Explain with the aid of a block diagram, the working principle of an F.M. radio receiver.<br>5.8 Explain with the aid of a block diagram, the working principle of a monochrome T.V receiver. | | | | | | |
| **GENERAL OBJECTIVES 6:** Understand the basic working principles of telephone and telegraph systems | | | | | | |
| 6.1 Explain the working principle of Manual telephone systems:<br>i. Simple telephone circuit;<br>ii. Magneto system; | | | | | | |

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| iii. Central Battery signaling.<br>6.2 Describe the working principle of an automatic telephone system.<br>6.3 Explain the significance of telephone trunk system.<br>6.4 Explain transmission of information using more code.<br>6.5 Outline the working principle of simple telephone circuit. | | | | | | |
| **GENERAL OBJECTIVES 7:** Know various frequency bands within the radio spectrum | | | | | | |
| 7.1 List the frequency range allocated to each of the following bands and their uses:<br>i. (e.l.f), extremely low frequency;<br>ii. (v.l.f) very low frequency;<br>iii. low frequency;<br>iv. (m.f) medium frequency;<br>v. (h.f.) high frequency;<br>vi. (v.h.f) very high frequency;<br>vii. (u.h.f.) ultra high frequency<br>viii. (s.h.f.) super high frequency;<br>ix. (e.h.f.) extremely | | | | | | |

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| high frequency. | | | | | | |
| **GENERAL OBJECTIVES 8:** Understand the principles of electromagnetic wave radiation | | | | | | |
| 8.1 Explain the function of an aerial as a radiator;<br>8.2 Know the current and voltage distribution of dipole;<br>8.3 Explain aerial impedance and radiation resistance;<br>8.4 Define an isotropic radiator;<br>8.5 Define the gain of an aerial.<br>8.6 Define the beam width of an aerial.<br>8.7 Sketch the polar diagram or the radiation patterns of a horizontal and vertical dipole.<br>8.8 Identify various types of aerials e.g. Yagi, Rhombic etc.<br>8.9 Sketch Yagi and rhombic aerials.<br>8.10 Explain the effect of frequency on aerial dimensions and performance.<br>8.11 Determine by experiment the parameters of an aerial. | | | | | | |
| **GENERAL OBJECTIVES 9:** Understand the principles of radio wave propagation. | | | | | | |
| 9.1 Explain the following terms in relation to wave propagation: | | | | | | |

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| i. Ground waves;<br>ii. Sky waves;<br>iii. Space waves.<br>9.2 Explain the existence and usefulness of the troposphere;<br>9.3 Explain the effects of the troposphere on propagation below 30MHz.<br>9.4 Explain the various layers of the ionosphere such as:<br>i. The d-layer;<br>ii. The e-layer;<br>iii. The p-layer.<br>9.5 Explain critical and maximum usable frequency.<br>9.6 Explain optimum working frequency.<br>9.7 Solve problems involving wave propagation. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING** | CODE: COM III | **CREDIT HRS: 30 HRS (2/0/0/WEEK)** |
| **COURSE: INTRODUCTION TO COMPUTERS** | **COURSES UNIT 2.0** | |
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**Goal:** To acquaint the students with equipments used for electronic data processing

**GENERAL OBJECTIVES:**
On completion of this module, the student should be able to:
10. Outline the role of the computer in modern society.
11. Understand computer Hardware configuration.
12. Know the concept of some software.
13. Know various type of computer data processing system.
14. Understand the basic principles of transmission.
15. Know number system.
16. Understand the concept of algorithm and flow charting.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Outline the role of the computer in modern society. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| **Historical Background**<br>1.1 Define the computer<br>1.2 Describe the development of computer in particular, Abacus, Pascal, Babbage, Hollerith and the ENIAC.<br>**Classification of Computers**<br>1.3 Classify computer | | | | | | |

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| according to generation from 1st to 5th generations (and any subsequent generations)<br>1.4 Distinguish between analog, digital and hybrid computers<br>**Computers and society**<br>1.5 Explain the social implications of computers on society, in particular privacies and quality of life.<br>1.6 List the benefits of computers to the society | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand computer Hardware configuration. | | | | | | |
| **Hardware configuration**<br>2.1 Describe computer hardware configuration.<br>2.2 List some input units.<br>2.3 Describe the function of the output units.<br>2.4 Describe the function of C.P.U<br>2.5 List some auxiliary units<br>2.6 Describe the functions of the auxiliary memory<br>2.7 Define bits, nibbles, bytes, word, storage size in terms of K. | | | | | | |
| **GENERAL OBJECTIVES 3:** Know the concept of some software. | | | | | | |
| **Concept of Software**<br>3.1 Distinguish between the low-level and high-level languages.<br>3.2 Explain source and | | | | | | |

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| object programs<br>3.3 Define a translator.<br>3.4 Describe types of translators; assembler; compiler; interpreter.<br>3.5 Explain the use of package programs. | | | | | | |
| **GENERAL OBJECTIVES 4:** Know various type of computer data processing system. | | | | | | |
| **Types of Computer data processing systems.**<br>4.1 Define Batch processing, Real time, processing, Time sharing and distributed processing.<br>4.2 Differentiate between Batch processing, Real Time processing, Time Sharing and distributed Processing systems. | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand the basic principles of transmission. | | | | | | |
| **Principles of Data Transmission**<br>5.1 Define Data Transmission.<br>5.2 Explain the term Telecommunications.<br>5.3 State different methods of data transmission.<br>5.4 List Data Transmission speeds. | | | | | | |
| **GENERAL OBJECTIVES 6:** Know number system | | | | | | |
| **Number Systems**<br>6.1 Describe binary, octal, decimal and hexadecimal number | | | | | | |

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| system.<br>6.2 Convert from one number system to another e.g. decimal to binary. | | | | | | |
| **GENERAL OBJECTIVES 7:** Understand the concept of algorithm and flow charting. | | | | | | |
| **Algorithms and flow chatting**<br>7.1 Define algorithms on very general basis.<br>7.2 Describe all ANSI flowcharts as descriptive algorithms. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: COM I22 | **CREDIT HRS: 75 HRS (2/3/0/WEEK)** |
| **COURSE: COMPUTER OPERATIONS** | **COURSES UNIT 3.0** | |
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**Goal:** To provide the student with working knowledge of the operations of computer systems.

**GENERAL OBJECTIVES:**
On completion of this module, the student should be able to:
1.0 Know the organizational structure of a data processing department.
2.0 Know the procedures of computer operations
3.0 Know the various types of data preparation methods and items of equipment used.
4.0 Know the importance of security within the computer environment.
5.0 Understand external file library structure.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Know the organizational structure of a data processing department. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| **Organizational structure of a DP Department.**<br>1.1 Describe the organizational structure of a data processing department.<br>1.2 Describe the functions of the various personnel in a data processing department. | | | | | | |
| **GENERAL OBJECTIVES 2:** Know the procedures of computer operations | | | | | | |
| **Procedures of Computer Operations**<br>2.1 Describe the principles and procedure of | | | | | | |

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| operating the computer system (fix up start-up and shut down system).<br>2.2 Identify the operating system environment as single-user, multi-user.<br>2.3 Identify the functions of the constituents of operating systems.<br>2.4 Explain operator system commands.<br>2.5 Describe the functions and operations of a master console.<br>2.6 Describe initialization and formatting of storage devices disks, tapes, diskettes etc. | | | | | | |
| **GENERAL OBJECTIVES 3:** Know the various types of data preparation methods and items of equipment used. | | | | | | |
| **Types of Data Preparation Methods**<br>3.1 Apply the techniques of capturing data in off line mode.<br>3.2 Perform data verification.<br>3.3 Explain data transmission methods.<br>3.4 Identify the items of equipment used 3.1 to 3.3 | | | | | | |
| **GENERAL OBJECTIVES 4:** Know the importance of security within the computer environment. | | | | | | |
| **Security of the Environment**<br>4.1 Explain data control techniques. | | | | | | |

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| 4.2 Identify and explain standard environment operating procedures of computer installations.<br>4.3 Explain the need for computer room.<br>4.4 Identify and describe computer systems auditing.<br>**Safety Procedures**<br>4.5 Explain prevailing safety regulations in computer installation.<br>4.6 Describe methods of preventing hazards (fire, flooding, sabotage etc).<br>4.7 Describe file security methods in computer installations.<br>4.8 Explain the need for file security in computer installations.<br>4.9 Explain the user passwords and user names. | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand external file library structure. | | | | | | |
| **External File Library Structure**<br>5.1 Describe the need for libraries in computer installations.<br>5.2 Describe a model library structure.<br>5.3 Explain the need for user identification procedure within an | | | | | | |

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| installation. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: COM 221 | **CREDIT HRS: 75 HRS (2/3/0/WEEK)** |
| **COURSE:COMPUTER PROGRAMMING (FORTRAN)** | **COURSES UNIT 3.0** | |
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**Goal:** The course is designed to enable the student to develop efficient, reliable computer programming in FORTRAN.

**GENERAL OBJECTIVES:**
On completion of this module, the student should be able to:
1.0 Know the basic building block of FORTRAN and the rules for using these.
2.0 Know how to control the execution of a program.
3.0 Know the other building blocks of FORTRAN.
4.0 Know some more advanced FORTRAN statements.
5.0 Adopt good style of programming

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Know the basic building block of FORTRAN and the rules for using these. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| **Building blocks of FORTRAN**<br>1.1 State the character set of FORTRAN.<br>1.2 Define constants and variables in FORTRAN.<br>1.3 Describe the different types of constants and variables in FORTRAN.<br>1.4 Describe the FORTRAN coding form. | | | | | | |

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| 1.5 Identify the general structure of a FORTRAN statement.<br>1.6 Write assignment statements.<br>1.7 State the precedence of arithmetic operations in FORTRAN.<br>1.8 Explain arithmetic functions in different operation modes.<br>1.9 Explain logical arithmetic with FORTRAN.<br>1.10 Distinguish between logical if and Arithmetic If statement.<br>1.11Describe the general form of FORTRAN statement.<br>1.12Write input statements READ/FORMAT.<br>1.13Write output statement WRITE/FORMAT.<br>1.14Explain the use of stop and END statements.<br>1.15Write sample FORTRAN programs using coding forms. | | | | | | |
| **GENERAL OBJECTIVES 2:** Know how to control the execution of a program. | | | | | | |
| **Execution of a program**<br>2.1 Identify the basic control execution of a program, statements: STOP, PAUSE, GOTO and the computed | | | | | | |

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| GOTO, the IF statement, and execution of a program using the DO/CONTINUE statements.<br>2.2 Control the execution of a program using the DO/CONTINUE statements.<br>2.3 Explain the nesting of DO S and the implied DO statement.<br>2.4 Explain the concept of subscripted variables, the use of arrays and the DIMENSION statement. | | | | | | |
| **GENERAL OBJECTIVES 3:** Know the other building blocks of FORTRAN. | | | | | | |
| **Other Building Blocks**<br>3.1 Identify the FORTRAN library blocks of FORTRAN functions.<br>3.2 Build and use FORTRAN subprogram functions subroutines.<br>3.3 Describe the use of statement functions. | | | | | | |
| **GENERAL OBJECTIVES 4:** Know some more advanced FORTRAN statements. | | | | | | |
| **Advance FORTRAN statements**<br>4.1 Control program execution using the, STOP, PAUSE, CALL AND EXIT statements.<br>4.2 Carry out advance data handling in programs by | | | | | | |

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| means of implicitly, DATA LIST, COMMON BLOCK and Equivalence statements.<br>4.3 Using debug facility statement. | | | | | | |
| **GENERAL OBJECTIVES 5:** Adopt good style of programming. | | | | | | |
| **Style of Programming**<br>5.1 Explain the "harmful effects" of GOTO.<br>5.2 Draw structure Flowcharts.<br>5.3 Describe the solution to a problem using pseudo-code.<br>5.4 Document a programme using HIPO Code. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: **CTE 212** | **CREDIT HRS: 30 HRS (2/0/0/WEEK)** |
| **COURSE: DIGITAL COMPUTER FUNDAMENTAL I** | **COURSES UNIT 2.0** | |
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**Goal:** This course is intended to provide the student 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** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand the concept of data and information presentation in digital system. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| **Number System and Code**<br>1.1 Define digits of a number.<br>1.2 Explain the base of a number.<br>1.3 List the number of digits of figures available in various number systems: Base 10, Base 8, Base 2, Base 16.<br>1.4 Outline the significance of weighting of digits in a number system. | | | | | | |

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| 1.5 Convert other number system to decimal and vice-versa.<br>1.6 Explain why binary number system is used in digital system.<br>1.7 State the special relationship between binary, octal and hexadecimal.<br>1.8 Explain the advantages of octal and hexadecimal over the binary data.<br>1.9 Describe the various binary based codes: BCD Code, Excess -3 code, Gray code, ASCII code and Seven-Segment display code.<br>1.10 Perform exercise in problems involving the conversion from one number system to another. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand the different codes used in digital system. | | | | | | |
| **Binary Arithmetic**<br>2.1 Explain the following binary operation, additions, subtraction, multiplication and division.<br>2.2 Explain signed binary number system.<br>2.3 Explain the difference between the | | | | | | |

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| representation of positive and negative numbers.<br>2.4 Define N's complement where N is any number.<br>2.5 Perform addition and subtraction using 1's complement.<br>2.6 Explain the limitation of 1's complement.<br>2.7 Explain 2's complement.<br>2.8 Perform addition and subtraction using 2's complement.<br>2.9 Identify fixed point and floating point numbers.<br>2.10 Explain the mantissa and characteristic of a floating point number.<br>2.11 Solve problems involving number systems.<br>2.12 demonstrate practically the binary operation in 2.11 above. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the various methods of minimization required to simplify digital combinational circuits. | | | | | | |
| **Minimization Procedures**<br>3.1 Explain Venn's diagram.<br>3.2 Use the Venn's diagram to explain:<br>i. Union of a set.<br>ii. Intersection of a set<br>iii. Universal sets<br>iv. Complement of a set | | | | | | |

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| 3.4 Apply venn's diagram to simplify Boolean expression.<br>3.5 Use Duality of a switching function to prove identities.<br>3.6 Explain the complement of function.<br>3.7 Solve problems by finding the complement of various functions using duality-method.<br>3.8 Explain the principles of karnaugh map.<br>3.9 Draw karnaugh map for two three and four variables.<br>3.10 State the advantages of Karnaugh map techniques for simplification of Boolean Algebra.<br>3.11 State Boolean Algebra postulations for: AND, OR, and NOT junctions.<br>3.12 Sketch logic diagram that implement the simplified logic expression in 3.11 above using 'AND' 'OR' and 'NOT' gates<br>3.13 Implement the circuit of 3.12 above using gates: AND and OR | | | | | | |

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| 3.14 Reduce a given Boolean equation having up to four variables to its simplest form.<br>3.15 Explain the importance of minimization in digital system design. | | | | | | |
| **GENERAL OBJECTIVES 4:** Know the fundamentals of Boolean Algebra | | | | | | |
| **Boolean Algebra**<br>4.1 define the inverse operation of Boolean Algebra and the or operation.<br>4.2 State the Boolean postulates: The commutative laws, Associative laws, Identity laws, Distributive laws, Negation law and De Morgan's theorem.<br>4.3 Define the truth table.<br>4.4 Construct a truth table for up to 4 variables.<br>4.5 Form logic expression from statement of conditions.<br>4.6 Define a Karnaugh map (K-map). | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand basic digital functions. | | | | | | |
| **Logic Functions**<br>5.1 Explain how YES/NO, TRUE/FALSE, ON/OF can be coded by '1' and '0' | | | | | | |

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| 5.2 Draw logic gate symbols to represent AND, OR, NOT NAND and NOR.<br>5.3 Explain the operation pf AND, OR and NOT using truth table and logic gates.<br>5.4 Solve problems involving basic logic functions. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: **CTE 211** | **CREDIT HRS: 75 HRS (2/3/0/WEEK)** |
| **COURSE: MICROCOMPUTER FUNDAMENTALS** | **COURSES UNIT 3.0** | |
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**Goal:** This course is intended to provide the student 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 the basic digital computer architecture.
3.0 Know the operation of the digital computer system.
4.0 Understand the preparation and handling of components of computer systems.
5.0 Understand the interconnections between the blocks of a computer.
6.0 Know the peripherals interface.
7.0 Know the various point devices.
8.0 Know the different types of modems and their uses.
9.0 Understand the multi-user environment

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Know the processor and the component parts. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Explain the microprocessor.<br>1.2 Explain the central processing unit (CPU).<br>1.3 Draw a block diagram of a typical microprocessor and explain the function of each component part. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand the basic digital computer architecture. | | | | | | |
| 2.1 Identify various blocks | | | | | | |

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| for making up the computer i.e:<br>a). I.O Devices (monitor, printer, keyboards etc)<br>b). Storage devices/memories<br>c). Control units<br>d). Power supplies: internal and external-UPS, AVR | | | | | | |
| **GENERAL OBJECTIVES 3:** Know the operation of the digital computer system. | | | | | | |
| 3.1 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 | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand the preparation and handling of components of computer systems. | | | | | | |
| 4.1 explain the preparation and handling of storage devices.<br>4.2 Explain the importance of control unit. | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand the interconnections between the blocks of a computer. | | | | | | |
| 5.1 Draw the linkages between the various blocks of a computer.<br>5.2 Explain the sequence of transmission of information between the various blocks.<br>5.3 Describe the various parts connection (serial, | | | | | | |

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| parallel) | | | | | | |
| **GENERAL OBJECTIVES 6:** Know the peripherals interface. | | | | | | |
| 6.1 Explain various general interface and the principles of I/O interface.<br>6.2 Explain various interfacing techniques. | | | | | | |
| **GENERAL OBJECTIVES 7:** Know the various point devices. | | | | | | |
| 7.1 Describe the various forms of pointing devices (mouse, the track ball, lighten etc.)<br>7.2 Carry out simple maintenance on the pointing devices. | | | | | | |
| **GENERAL OBJECTIVES 8:** Know the different types of modems and their uses. | | | | | | |
| 8.1 Identify the various modems with transmission speeds without repeaters. | | | | | | |
| **GENERAL OBJECTIVES 9:** Understand the multi-user environment. | | | | | | |
| 9.1 Connect simple multi-user systems without repeater stations. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: **CTE 212** | **CREDIT HRS: 45 HRS (0/3/0/WEEK)** |
| **COURSE: COMPUTER WORKSHOP PRACTICE I** | **COURSES UNIT 1.0** | |
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**Goal:** This course is intended to enable the students to have the knowledge of the various components of the computer system assemble and install the system.

**GENERAL OBJECTIVES:**
On completion of this module, the student should be able to:
1.0 Know the various components of the computer system.
2.0 The use of installation/maintenance manual.
3.0 Know preventive maintenance.
4.0 Assemble and install a computer system

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Know the various components of the computer system. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Identify the system unit, monitor, mouse, scanner, printer, plotter etc.<br>1.2 Identify the various components of the system unit such as:<br>✓ Motherboards<br>✓ CPU<br>✓ CPU overdrive<br>✓ Controller card<br>✓ VGA card | | | | | | |

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| ✓ Expansion slots (8,16,32,64 bits)<br>1.3 Identify the hard disk types EIDE, IDE, SCSI etc.<br>1.4 Identify the memory types on the board/card: Cache, VRAM, SRAM, DRAM etc.<br>1.5 Identify the floppy disk drives $3^{1/2}$ / $5^{1/4}$ disk drives. | | | | | | |
| **GENERAL OBJECTIVES 2:** The use of installation/maintenance manual. | | | | | | |
| 2.1 Interpret the installation/maintenance manuals.<br>2.2 Carry out RAM upgrade.<br>2.3 Explain site preparation method.<br>2.4 Explain the need for equipment inventory.<br>2.5 Carry out the pre-installation checks of a computer i.e. electrical, mechanical, humidity etc.<br>2.6 Carry out simple computer installation. | | | | | | |
| **GENERAL OBJECTIVES 3:** Know preventive maintenance. | | | | | | |
| 3.1 Explain the importance of preventive maintenance of hardware.<br>3.2 Carry out routine cleaning and | | | | | | |

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| demagnetization of disk drives, motherboards etc.<br>3.3 Demonstrate prevention procedures e.g. routine checks.<br>3.4 Apply dust prevention procedure for Computer systems, Carpets etc.<br>3.5 Know how to make system disks with utilities. | | | | | | |
| **GENERAL OBJECTIVES 4:** Assemble and install a computer system. | | | | | | |
| 4.1 Assemble a computer system.<br>4.2 Installation and configuration of a computer system. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: **CTE 213** | **CREDIT HRS: 75 HRS (0/3/0/WEEK)** |
| **COURSE: DIGITAL COMPUTER FUNDAMENTAL II** | **COURSES UNIT 4.0** | |
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**Goal:** This course is intended to provide the student with basic understanding of the composition and characteristics of digital computers.

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1.0 Understand the features of different logic gates.
2.0 Know the sequence and data flow controls.
3.0 Understand the basic principles of bistable elements.
4.0 Understand the principle of the counter and data transfer register.
5.0 Know the implementation of the addition operation in the computer
6.0 Know the different digital circuit components.
7.0 Understand the characteristic of basic digital devices.
8.0 Understand the design and construction of simple combinational logic circuits using the basic devices.
9.0 Understand the operation of the basic principles of bistable elements.
10.0 Understand the operation of simple sequential circuits.

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| **Theoretical Content** | | | | | | |
| **GENERAL OBJECTIVES 1:** Understand the features of different logic gates.. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Explain the principle of operation of combinational logic.<br>1.2 Illustrate the action of gates using truth table.<br>1.3 Write down a logical sum of product equations.<br>1.4 Draw circuit diagram that implements the equation of 1.3 using AND, OR, NOT gates:<br>i. NAND<br>ii. NOR<br>iii. Exclusive – OR<br>iv. Exclusive – NOR functions.<br>1.5 Design logic circuits using a combination of logic gates.<br>1.6 Describe the action of the Diode.<br>1.7 Describe the construction of the AND, or OR gates using diode. | | | | | | |
| **GENERAL OBJECTIVES 2:** Know the sequence and data flow controls. | | | | | | |
| 2.1 Explain error detection.<br>2.2 Explain the features and attributes of the different logic families.<br>2.3 Explain the | | | | | | |

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| characteristics and circuit parameter of logic families e.g.<br>i. Fan-in/fan-out.<br>ii. Speed/power factor logic levels.<br>iii. Noise immunity<br>iv. Heat dissipation | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the basic principles of bistable elements. | | | | | | |
| 3.1 Define a bistable (flip flop).<br>3.2 Describe the action of a flip flop.<br>3.3 Describe the operation of the following bistables elements:<br>i. RS Flip-flop;<br>ii. Clocked RS flip-flop;<br>iii. D-flip-flop, T flip-flop (toggle flip-flop J-K – Flip flop.<br>3.4 Explain the function of preset and clear of the bistables element.<br>3.5 Describe some specific I.C bistable elements e.g. SN7474 and SN 7476 | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand the principle of the counter and data transfer register. | | | | | | |
| 4.1 Describe the operation of the basic binary ripple counter.<br>4.2 Describe operation of the up and down counters. | | | | | | |

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| 4.3 Describe the operation of the modules counter using as example Mod-10, Mod-12, and Mod-6 counters.<br>4.4 Define a shift-left, a shift-right and shift round registers.<br>4.5 Describe the parallel transfer of data through registers.<br>4.6 Describe the serial-parallel transfer operation. | | | | | | |
| **GENERAL OBJECTIVES 5:** Know the implementation of the addition operation in the computer. | | | | | | |
| 5.1 Describe the serial adder.<br>5.2 Describe the parallel adder.<br>5.3 Describe the half-adder.<br>5.4 Describe the full-adder. | | | | | | |
| **GENERAL OBJECTIVES 6:** Know the different digital circuit components. | | | | | | |
| 6.1 Describe different logic element.<br>6.2 Identify AND, OR, NOT, NOR, NAND, and XOR gates | | | | | | |
| **GENERAL OBJECTIVES 7:** Understand the characteristic of basic digital devices. | | | | | | |
| 7.1 Describe the operation of different logic elements e.g. AND, OR, NOT etc gates.<br>7.2 Demonstrate practically the logic operation of AND, OR NOT using Logic gates and | | | | | | |

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| Discrete elements. | | | | | | |
| **GENERAL OBJECTIVES 8:** Understand the design and construction of simple combinational logic circuits. | | | | | | |
| 8.1 Analyze and draw the circuit diagram that implement various circuit combinations.<br>8.2 Demonstrate practically the operations of combinational logic function. | | | | | | |
| **GENERAL OBJECTIVES 9:** Understand the operation of the basic principles of bistable elements. | | | | | | |
| 9.1 Draw some specific IC bistable elements e.g. SN 7474, SN 7476<br>9.2 Construct the elements in 4.1 above. | | | | | | |
| **GENERAL OBJECTIVES 10:** Understand the operation of simple sequential circuits. | | | | | | |
| 10.1 Analyse the design techniques of sequential circuits.<br>10.2 Perform experiments to illustrate sequential circuit (counters, registers) using the various bistable elements. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: **CTE 214** | **CREDIT HRS: 15 HRS (0/3/0/WEEK)** |
| **COURSE: COMPUTER ARCHITECTURE** | **COURSES UNIT 1.0** | |
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**Goal:** This course is intended to provide the ND students with a skeletal knowledge of the structural and functional characteristics of the various components of a computing system.

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1.0 Know the basic concept of computer architecture

2.0 Understand concept of memory organization

3.0 Appreciate the conventional 8/16/32-bit computer architecture

4.0 Know the addressing modes

5.0 Know interrupts and their various types

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Know the basic concept of computer architecture | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Describe the various word formats.<br>1.2 Explain the concept of Von Neumman's Structure.<br>1.3 Explain various units and registers of a typical CPU.<br>1.4 Explain the various methods of addressing software and hardware trade offs. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand concept of memory organizations | | | | | | |
| 2.1 Explain microcomputer control Bus, Address Bus and Data Bus.<br>2.2 Explain the use of memory management and mention techniques commonly used.<br>2.3 Explain the concept of cache memory. | | | | | | |
| **GENERAL OBJECTIVES 3:** Appreciate the conventional 8/16/32-bit computer architecture | | | | | | |
| 3.1 Explain the Von Neumman's Structure<br>3.2 Explain conventional 8/16/32 bit computer architecture.<br>3.3 Define the concept of pipeline instruction | | | | | | |

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| sets, reduced instruction.<br>3.4 List microprocessor CPU of 8/16/32 bit architecture. | | | | | | |
| **GENERAL OBJECTIVES 4:** Know the addressing modes | | | | | | |
| 4.1 Explain instruction components opcode and operand.<br>4.2 Explain operand types-Register, Memory, and immediate.<br>4.3 Explain instruction Fetch and Execute.<br>4.4 Explain addressing modes-Direct, indirect, immediate and indexing. | | | | | | |
| **GENERAL OBJECTIVES 5:** Know interrupts and their various types | | | | | | |
| 5.1 Define interrupt and Enumerate types.<br>5.2 Explain Branching techniques. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: **CTE 221** | **CREDIT HRS: 60 HRS (0/3/0/WEEK)** |
| **COURSE: COMPUTER PROGRAMMING (ASSEMBLY LANGUAGE)** | **COURSES UNIT 2.0** | |
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**Goal:** This course is designed to provide the student with skills in programming in Assembly language and intro to Micro Programming

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1.0 Understand number system.

2.0 Know the basic terms in assembly language.

3.0 Understand the different instruction formats.

4.0 Know the representative groups of instruction in the instruction set.

5.0 Know the different addressing modes.

6.0 Know the assembly language program layout.

7.0 Understand the process of running assembly language programs.

8.0 Understand the micro processor and how to program on a micro processor.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Understand number system. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Describe the binary, octal and hexadecimal number systems.<br>1.2 Explain the conversion between the base in 1.1 above.<br>1.3 Describe addition, multiplication, subtraction and division in binary number system.<br>1.4 Describe addition and subtraction in octal and hexadecimal number system. | | | | | | |
| **GENERAL OBJECTIVES 2:** Know the basic terms in assembly language. | | | | | | |
| 2.1 Define the following terms: Operation code operand, instruction and register.<br>2.2 Explain the relationships among operation code, operand and instruction.<br>2.3 Explain and illustrate with examples what is meant by machine instruction.<br>2.4 Describe zero, one and two – operand | | | | | | |

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| instructions.<br>2.5 Explain the difference between a machine language and an assembly language. | | | | | | |
| **GENERAL OBJECTIVES 3:** Understand the different instruction formats. | | | | | | |
| 3.1 Explain instruction formats.<br>3.2 Explain the fields of an instruction format.<br>3.3 Explain the function of registers.<br>3.4 Describe different types of instructions register – register storage, storage-storage. Indexed register and immediate operand instructions. | | | | | | |
| **GENERAL OBJECTIVES 4:** Know the representative groups of instruction in the instruction set. | | | | | | |
| 4.1 Define an instruction set.<br>4.2 Describe arithmetic instruction: addition, subtraction, multiplication and division.<br>4.3 Describe AND, OR and exclusive NOR instruction.<br>4.4 Describe the branch instruction: conditional and unconditional.<br>4.5 Implement the conditional and unconditional branch | | | | | | |

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| instructions.<br>4.6 Describe, compare instruction.<br>4.7 Describe load and store instruction.<br>4.8 Describe bit manipulation instruction.<br>4.9 Describe move instructions.<br>4.10 Explain input/output instruction. | | | | | | |
| **GENERAL OBJECTIVES 5:** Know the different addressing modes.. | | | | | | |
| 5.1 Describe different types of addressing modes: relative, absolute, register, immediate, indexed and deferred.<br>5.2 List examples of each types of addressing modes in 5.1 above. | | | | | | |
| **GENERAL OBJECTIVES 6:** Know the assembly language program layout. | | | | | | |
| 6.1 Describe the position of labels, oeration codes, operands and comments.<br>6.2 Illustrate the positions in 6.1 above with assembly language coding forms.<br>6.3 Describe free format and formatted source program. | | | | | | |
| **GENERAL OBJECTIVES 7:** Understand the process of running assembly language programs. | | | | | | |
| 7.1 Describe the command sequence required to | | | | | | |

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| run an Assembly language program.<br>7.2 Run assembly language program.<br>7.3 Explain the running of Assembly language e.g. BASIC, PASCAL, COBOL. | | | | | | |
| **GENERAL OBJECTIVES 8:** Understand the micro processor and how to program on a micro processor. | | | | | | |
| 8.1 Define the term microprogramming.<br>8.2 Describe the difference between microprogram and hard-wired system.<br>8.3 Draw the Microprogram system and hardwired system and explain the functions of each component.<br>8.4 Explain the Microprocessor's function in a system and show the layout of the expression.<br>8.5 Describe the basic structure of a microprocessor, a register and operation of a microprocessor based computer.<br>8.6 Demonstrate the use of substitute memory command, NEXT command, EXC GO command, Examine | | | | | | |

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| Register command.<br>8.7 Demonstrate – Register Data Transfer single step command.<br>8.8 Write some basic data transfer instruction.<br>8.9 Write the hand assembly, coding form (8 bit).<br>8.10 The direct, indirect addressing.<br>8.11 Explain the BCD Arithmetic instruction, using the Ib – b Arithmetic.<br>8.12 Explain the BCD Arithmetic.<br>8.13 Demonstrate the use of logical operators, such as the logical AND, Logical OR, Exclusive OR, rotate and compare.<br>8.14 Write simple programs, using the jump and subroutine instruction. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: **CTE 222** | **CREDIT HRS: 45 HRS (0/3/0/WEEK)** |
| **COURSE: COMPUTER WORKSHOP PRACTICE II** | **COURSES UNIT 1.0** | |
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**Goal:** This course is intended to train the students in general corrective maintenance, diagnostic techniques and to a greater extent understand 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.

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| **Theoretical Content** | | | | | | |
| **GENERAL OBJECTIVES 1:** Understand the circuit diagrams of monitors, UPS Power Packs etc. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Understand the circuit diagrams and identify the components in Monitors, UPS, Power packs etc. | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand the principles of operation and use of basic electronic measuring instruments in trouble shooting. | | | | | | |
| 2.1 Using multimeter, oscilloscope to test the various components on board/cards such as: resistors, diodes, transistors, ICS etc.<br>2.2 Explain basic trouble-shooting techniques in computer fault diagnosis e.g. fault identification by eliminations<br>2.3 Explain types of cables, choice and methods of testing, as well as the instruments used for testing:<br>i. Twisted pair cable.<br>ii. Coaxial cables<br>iii.RS-232 standard communication cables. | | | | | | |

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| **GENERAL OBJECTIVES 3:** Know diagnostic techniques involved in corrective maintenance. | | | | | | |
| 3.1 Explain the need for diagnostic software: Disk manager, Checkkit, Norton, PC Tools, some utilities in MS-Dos and MS-windows and Scandisk, defreg, mammaker, etc.<br>3.2 Use diagnostic software in corrective maintenance.<br>3.3 Use anti-virus kits in detection, cure and prevention of virus. | | | | | | |
| **GENERAL OBJECTIVES 4:** Trace faults on the various components of the circuits using a modular approach. | | | | | | |
| 4.1 Trace and identify faults on various components of the circuits and correct the errors logic using modular approach: Monitor, UPS, Power pack and Boards and cards etc. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: **CTE 223** | **CREDIT HRS: 30 HRS (0/3/0/WEEK)** |
| **COURSE: OPERATING SYSTEM** | **COURSES UNIT 2.0** | |
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**Goal:** The course is designed to teach the functions of operating systems

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1.0 Know the different types of operating systems

2.0 Know the function and philosophy of operating systems

3.0 Know the components of an operating system

4.0 Understand the general concept of system programming

5.0 Understand the use of utilities and libraries

6.0 Understand input/output devices handlers

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Know the different types of operating systems | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Define operating systems.<br>1.2 Explain the importance of operating systems using real-life examples e.g. DOS, Windows, UNIX, etc.<br>1.3 Classify operating systems into closed shop and open shop.<br>1.4 List some examples of closed- shop and open-shop operating systems<br>1.5 Apply the operating systems in 1.4 above to micro and main frame computers<br>1.6 Define, batch, Real-time, Time-sharing and net working operating systems<br>1.7 List some examples of Batch, real-time, Time-sharing and net working operating systems | | | | | | |
| **GENERAL OBJECTIVES 2:** Know the function and philosophy of operating systems | | | | | | |
| 2.1 State the functions of operating systems in relation to memory management, processor | | | | | | |

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| management, device management and interrupt handling and information management.<br>2.2 State the characteristics of operating systems: concurrency, sharing, long-term storage and non-determinacy.<br>2.3 State the features of operating systems: efficiency, reliability, maintainability and size.<br>2.4 Carry out operating systems design techniques: top-down, bottom up. | | | | | | |
| **GENERAL OBJECTIVES 3:** Know the components of an operating system | | | | | | |
| 3.1 Define operating system files –IO.SYS, COMMAND.COM, CONFIG.SYS.<br>3.2 Describe the functions of the basic commands: i.e. FORMAT, DIR, CHKDSK, TYPE, BACKUP, MODE, SYS, AUTOEXEC, DISCOMP, FDISK, etc. | | | | | | |
| **GENERAL OBJECTIVES 4:** Understand the general concept of system programming | | | | | | |
| 4.1 Define Systems Programming.<br>4.2 Define application | | | | | | |

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| programming<br>4.3 Differentiate between a systems program and an application program.<br>4.4 Identify areas involved in systems programming e.g. compilers, assemblers, operating systems, device drivers, interrupt handlers | | | | | | |
| **GENERAL OBJECTIVES 5:** Understand the use of utilities and libraries | | | | | | |
| 5.1 Define utilities.<br>5.2 Explain utilities.<br>5.3 Define Library.<br>5.4 Explain Libraries.<br>5.5 Relate utilities to Libraries.<br>5.6 Implement libraries and utility programs | | | | | | |
| **GENERAL OBJECTIVES 6:** Understand input/output devices handlers | | | | | | |
| 6.1 Describe I/O processing<br>6.2 Describe interrupts, masking.<br>6.3 Describe traps.<br>6.4 Differentiate between traps and interrupts<br>6.5 Explain CPU states. | | | | | | |

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| **PROGRAMME: NATIONAL DIPLOMA IN COMPUTER ENGINEERING TECHNOLOGY** | CODE: **CTE 223** | **CREDIT HRS: 75 HRS (0/3/0/WEEK)** |
| **COURSE: COMPUTER POWER SYSTEMS (INSTALLATION AND MAITENANCE)** | **COURSES UNIT 3.0** | |
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**Goal:** The course is intended to provide the students with the general knowledge of different energy sources applicable in computer systems. It is also designed to introduce students to computer network installations.

**GENERAL OBJECTIVES:**

On completion of this module, the student should be able to:

1.0 Know the types of power supply sources for computer systems.

2.0 Understand the necessity for uninterruptible power supply and the general principle of UPS.

3.0 Know the types of protection against power supply fluctuation, surges and outages, static electricity etc.

4.0 Know the types of cabling requirements and installation in computer systems and networks.

5.0 Know the basic power supply units and methods of troubleshooting in computer networks.

6.0 Know the types of protection required for data line against fluctuation, surges and outages.

| **Theoretical Content** | | | | | | |
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| **GENERAL OBJECTIVES 1:** Know the types of power supply sources for computer systems. | | | | | | |
| **Specific Learning Outcomes** | **Teacher's Activities** | **Learning Resources** | | | | |
| 1.1 Explain the different sources of electrical energy applicable in powering computer systems<br>i). National grid supply<br>ii). Standby generator<br>iii). Solar cells | | | | | | |
| **GENERAL OBJECTIVES 2:** Understand the necessity for uninterruptible power supply and the general principle of UPS. | | | | | | |
| 2.1 Explain the need fore steady power supply as a means of protecting computer software.<br>2.2 Explain the principle of operation and components of a UPS. | | | | | | |
| **GENERAL OBJECTIVES 3:** Know the types of protection against power supply fluctuation, surges and outages, static electricity etc. | | | | | | |
| 3.1 Explain the principles of operation of Automatic Voltage Regulator (AVR).<br>3.2 Explain the principles of operation and components of Automatic Voltage switcher (AVS).<br>3.3 Explain the sources and effects of static electricity and methods of its elimination. | | | | | | |

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| **GENERAL OBJECTIVES 4:** Know the types of cabling requirements and installation in computer systems and networks | | | | | | |
| 4.1 Explain the types of cables used in;<br>i). Power supply<br>ii). Communication between systems.<br>iii). Communication between systems and peripherals.<br>4.2 Explain methods of cabling for computer networks:<br>i). Suspended ceilings<br>ii). Raised floors<br>iii). Cable trays<br>4.3 Explain the types of cables choice and methods of testing, as well as the instruments used for testing:<br>i) Twisted pair cables<br>ii) Coaxial cables<br>iii) RS-232 standard communication cables. | | | | | | |
| **GENERAL OBJECTIVES 5:** Know the basic power supply units and methods of troubleshooting in computer networks. | | | | | | |
| 5.1 Explain the principles of operation and trouble shooting methods of power supply units:<br>i) Transformer<br>ii) Rectifiers<br>iii)Voltage stabilizers<br>5.2 Explain the process of cooling and the essence of having a good | | | | | | |

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| ventilation and cooling systems. | | | | | | |
| **GENERAL OBJECTIVES 6:** Know the types of protection required for data line against fluctuation, surges and outages. | | | | | | |
| 6.1 Explain the methods of testing data lines and identifying faults.<br>6.2 Identify the types of protection of integrity of data in computer networks. | | | | | | |