

# Electrical Engineering Technology - National Diploma (ND)

## DRAWING COURSES

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# Technical Drawing

MEC 111 TECHNICAL DRAWING YI/1<sup>ST</sup> SEM 0/0/4 Hrs/WK

## OUTCOMES:

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

1. Know different drawing instruments, equipment and materials used in technical drawing.
2. Know graphical communication.
3. Know the construction of simple geometrical figures and shapes.
4. Know Isometric and Oblique Projections.
5. Know single orthographic projections.
6. Understand the interactions of regular solids.

PROGRAMME: NATIONAL DIPLOMA IN MECHANICAL ENGINEERING			
COURSE: TECHNICAL DRAWING		Course Code: MEC 111	Contact Hours: 60 hrs.
Course Specification: Theoretical Content			
General Objective 1.0: Know different drawing instruments, equipment and materials used in technical drawing.			
Week	Specific Learning Outcome:	Teachers Activities	Resources
1	1.1 Identify the different types of drawing instruments, equipment and materials. 1.2 Outline the uses of the various instruments, equipment and materials. 1.3 State the precautions necessary to preserve items 1.1 above. 1.4 Use each of the items in 1.1 above. 1.5 Maintain the various instruments and equipment.	<ul style="list-style-type: none"> <li>• Present the students all drawing instruments:               <ul style="list-style-type: none"> <li>a. Drawing set</li> <li>b. T-Square</li> <li>c. Drawing board</li> <li>d. Set squares</li> <li>e. Types of pencils (H to B)</li> <li>f. Show to demonstrate and explain the uses of all of the above.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Black board ruler (1m)</li> <li>• Black board Tee-Square</li> <li>• Black board compass</li> <li>• Blackboard protector</li> <li>• Adjustable set-square</li> <li>• 60 set square</li> </ul>

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<b>Course Specification: Theoretical Content</b>			
<b>General Objective 1.0: Know different drawing instruments, equipment and materials used in technical drawing.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
1			<ul style="list-style-type: none"> <li>• 45 set square</li> <li>• French curve set</li> <li>• Templates</li> <li>• Duster</li> <li>• Chalk</li> <li>• Complete drawing table</li> </ul>
<b>General Objective 2.0: Know Graphical Communication</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
2	2.1 Explain graphics and the different types of graphic present 2.2 Illustrate the various convention present in graphical productions of construction lines, finished lines, hidden and overhead details projections, centre lines, break lines, dimensioning of plane, elevation and sections of objects.	<ul style="list-style-type: none"> <li>• Ask the students to illustrate in a drawing the various types of lines based on BS 308 1972 Part 2. and assess.</li> <li>• Ask the students to set drawing area on A1 paper with a title block and the boarder lines and assess.</li> </ul>	- do -
3	2.3 Layout of drawing sheets with the following (a) Margins (b) Title block etc. 2.4 State the various standards of drawing sheets. 2.5 Print letters and figures of various forms and characters. 2.6 Illustrate conventional signs, symbols and appropriate lettering characters.	<ul style="list-style-type: none"> <li>• Ask students to illustrate technical lettering in capital and small letters, using, free hand and using letter stencils and assess.</li> <li>• Ask students to identify the various standard sheets Ao -A4 and assess</li> <li>• Ask students to draw conventional signs and symbols</li> <li>• and assess</li> </ul>	

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<b>Course Specification: Theoretical Content</b>			
<b>General Objective: 3.0 Know the construction of simple geometrical figures and shapes.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
4	3.1 Explain the purpose of geometrical construction in drawing parallel. 3.2 Construct parallel and perpendicular lines 3.3 Construct and bisect lines, angles and areas 3.4 Divide a straight line into given number of equal parts.	<ul style="list-style-type: none"> <li>• Ask students to illustrate the construction of simple geometrical figures and shapes and assess</li> <li>• Ask students to construct parallel and perpendicular lines and assess</li> <li>• Ask students to construct and bisect lines, angles and areas and assess</li> <li>• Ask students to divide a straight line into a graph number of equal parts using the compasses and assess</li> </ul>	
	3.5 Identify polygons (regular or irregular) 3.6 Construct regular polygons with N sides in a given circle, given (a) distance across flats (b) distance across corners 3.7 Define a circle 3.8 Explain the properties of a circle, e.g. radius, diameter, normal, tangent, circumference etc.	<ul style="list-style-type: none"> <li>• Ask students to differentiate between regular and irregular polygons and assess</li> <li>• Ask students to construct regular polygon with N side</li> <li>• and assess</li> <li>• Ask students to differentiate between regular and irregular polygons and assess</li> <li>• Ask students to construct regular polygon with N-sides</li> <li>• and assess</li> </ul>	
<b>General Objective 4.0: Know the construction of simple geometrical figures and shapes.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
5	4.1 Carry out simple geometrical constructions on circles e.g. (a) diameter of a circle of a circle of a given circumference. (b) the circumference to a circle of a given diameter (c) a circle to pass through 3 points (d) a circle to pass through 2	Ask students to explain the various properties of a circle and assess	- do -

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<b>Course Specification: Theoretical Content</b>			
<b>General Objective 4.0: Know the construction of simple geometrical figures and shapes.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
5	points and touch a given line (e) a circle to touch a given smaller circle and a given line (f) tangents to circles at various points (g) an arc of radius tangent to two lines at an angle to less than and more than 90 (h) an are externally tangent to two circles (i) inscribing and circumscribing circles		
6	4.2 Define an ellipse 4.3 Construct ellipse by using (a) trammal method (b) concentric circle method. 4.4 Explain the following draughting techniques (a) Projection method (b) Measurement method (c) Transposition method. 4.5 Construct plane scales and diagonal scales, using appropriate instruments.	<ul style="list-style-type: none"> <li>• Ask students to differentiate the different methods of constructing ellipses and assess</li> <li>• Ask students to construct an ellipse using the various methods and assess</li> <li>• Ask students to explain the various draughting techniques and assess</li> <li>• Ask students to construct plane and diagonal scales</li> <li>• and assess.</li> </ul>	
<b>General Objective 5.0: Know Isometric and Oblique Projections.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
7	5.1 Explain isometric and oblique projections.	<ul style="list-style-type: none"> <li>• Ask students to differentiate between Isometric and oblique projections and assess</li> <li>• Ask students to construct a square and circle in isometric and oblique projections and assess</li> <li>• Ask students to draw a polygon in isometric and oblique projections and assess</li> <li>• Ask students to construct and dimension holes circles, arcs and angles in isometric and oblique projection and label with appropriate conventional symbols and</li> </ul>	
8	5.2 Draw a square in isometric and oblique forms		
9	5.3 Draw a circle in Isometric and oblique forms 5.4 Draw an ellipse in Isometric and oblique forms.		
10	5.5 Draw a polygon with a minimum of eight sides in Isometric and oblique forms 5.6 Dimension holes, circles, arcs and angles correctly on isometric and obliques. 5.7 Use appropriate convention symbols and abbreviations.		

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<b>Course Specification: Theoretical Content</b>			
<b>General Objective 5.0: Know Isometric and Oblique Projections.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
		abbreviations and assess	
<b>General Objective 6.0: Know single orthographic projections.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
11 - 12	6.1 Explain the principle of orthographic projection. 6.2 Illustrate the principle planes of projection (a) Vertical plane (b) Horizontal plane . 6.3 Explain why the first and third angles are used and the second and fourth angles not used. 6.4 Project views of three-dimensional objects on to the basic planes of projection in both first and third angle to obtain (a) the front view or elevation (b) the top view or plan.	<ul style="list-style-type: none"> <li>• Ask students to differentiate between first and third angle orthographic projection and assess</li> <li>• Ask students to explain the vertical and horizontal planes in orthographic projection and assess</li> <li>• Ask students to construct orthographic projections of simple objects in first and third angle orthographic projections and assess</li> </ul>	
<b>General Objective: 7.0 Understand the intersections of regular solids.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
13 - 15	7.1 Explain interpretation or intersections of solids. 7.2 Draw the lines of intersections of the following regular solids and planes in both first and third angles. <ul style="list-style-type: none"> <li>a. Two square-prisms meeting at right angles.</li> <li>b. Two dissimilar square prisms meeting at an angle.</li> <li>c. Two dissimilar square prisms meeting to an angle</li> <li>d. A hexagonal prism meeting a square prism at right</li> <li>e. angles.</li> <li>f. Two dissimilar cylinders meeting at an angle.</li> <li>g. Two dissimilar cylinders meeting</li> </ul>	<ul style="list-style-type: none"> <li>• Ask students to give examples of intersection of solids</li> <li>• Ask students to construct:               <ul style="list-style-type: none"> <li>• Two square-prisms meeting at right angles                   <ul style="list-style-type: none"> <li>a. Two dissimilar square prisms meeting at "</li> <li>b. Two dissimilar square prisms meeting 60</li> <li>c. An hexagonal prism meeting a square prism</li> <li>d. Two dissimilar cylinders meeting at</li> </ul> </li> </ul> </li> </ul>	

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<b>Course Specification: Theoretical Content</b>			
<b>General Objective: 7.0 Understand the intersections of regular solids.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
13 - 15	at right angle, their centres not being in the same vertical plane.	an angle e. Two disjoint cylinders meeting at right angle, then centres at long in the same vertical place. f. As in 6.2	
<b>ASSESSMENT:</b> The continuous assessments, tests and quizzes will be awarded 40%, while the remaining 60% will be for the end of the Semester Examination Score.			

# Electrical Graphics

EEC111 ELECTRICAL GRAPHICS PRACTICAL Y1/1st SEMESTER 1/0/3 hrs/wk

**Objectives:**

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

1. Read and interpret Electrical and Electronic drawings.
2. Draw Electrical Installation, machines, and electronic circuits using standard symbols.
3. Use a computer package to do simple computer graphics.

<b>COURSE: ELECTRICAL GRAPHICS COURSE</b>	<b>CODE: EEC111</b>	<b>CONTACT HOUR: 15 HRS LECTURE 45 HRS TUT.</b>	
<b>Course Specification : Theoretical Content</b>			
<b>General Objective: Interpret and draw electrical and electronics diagrams using symbols and software.</b>			
Week	Specific Learning Outcome:	Teacher's activities	Resources
1 - 3 4 - 5 6 - 7 8 - 9 10 - 11 12	1.1 Identify and learn electrical and electronic symbols for a. Machines b. Wiring diagrams with codes c. Switch gear, fuses, relays etc. d. Voltage sources and current sources. e. Semi-conductor devices. f. Integrated chips of the 74 series g. Resistors, Capacitors, Inductors, Transformers.	• Try and obtain samples of all the components identified by the list to show the students and circulate round the class.  • Obtain copies of relevant drawings to give to students for each section of the course.	• Chalkboards, Textbooks, Templates, Drawing Materials and equipment, Computer Systems.
13 - 15	1.2 Practise reading and interpreting Electrical, Building and Electronic diagrams. 1.3 Distinguish between SYMBOLIC and COMPONENT diagrams. 1.4 Practise drawing Symbolic Electrical circuits as used in text books. 1.5 Practice drawing Building wiring diagrams showing all components, wiring, conduits, switch boxes, wall plugs. 1.6 Practise translating drawings of "Electrical		

COURSE: ELECTRICAL GRAPHICS COURSE		CODE: EEC111	CONTACT HOUR: 15 HRS LECTURE 45 HRS TUT.
<b>Course Specification : Theoretical Content</b>			
<b>General Objective: Interpret and draw electrical and electronics diagrams using symbols and software.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teacher's activities</b>	<b>Resources</b>
13 - 15	<p>Power experiments" from the symbolic diagrams to wiring diagrams showing terminals and earth points and how " 2 input Oscilloscopes" should be connected without shorting the circuit</p> <p>1.7 Pay special attention to component layout on the diagram.</p> <p>1.8 Practise drawing Electronic circuit diagrams using different semi-conductor components and Integrated chip components.</p> <p>1.9 If computers are available practice using some drawing package, even if only the drawing component of "Microsoft WORD".</p>		
<b>ASSESSMENT:</b> The Practical class will be awarded 40% of the total score. The continuous assessments, tests and quizzes will take 10% of the total score, while the remaining 50% will be for the end of the semester examination score.			

# Electrical Installation of Building

EEC 129 ELECTRICAL INSTALLATION OF BUILDING YI/2<sup>ND</sup> SEM 1/0/2 HRS/WK

## OUTCOMES:

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

1. Identify and draw electrical/electronic graphical symbols.
2. Know and draft various wiring diagrams
3. Draft and interpret various architectural drawings and symbols.
4. Know different sizes and applications of cables
5. Understand installation of various electrical/electronic systems

<b>Course: WORKSHOP EXERCISES ON ELECTRICAL INSTALLATION OF BUILDING</b>		<b>Course Code: EEC 129</b>	<b>Contact Hours: 15 Hrs Lecture</b>
<b>Course Specification: Practical</b>			
<b>General Objective: Draw and produce various installation diagrams for domestic, industrial and commercial purposes.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
1 2 - 3 4 - 5 6 - 7 8 - 9 10 - 11 12 - 13 14 - 15	1.1 Draw electrical/electronic graphical symbols 1.2 Draft various electrical/electronic schematic diagrams 1.3 Draft various electrical installation/wiring diagrams 1.4 Draft architectural drawings of simple buildings e.g. 3-bedroom flat etc 1.5 Produce elevation drawings for architectural drawings 1.6 Draft electrical services for a residential building e.g. 3-bedroom flat 1.7 Draft electrical supply for a 3-bedroom building 1.8 Draw the installation diagram for a single phase and three-phase energy meters in domestic and commercial/industrial premises.	• The teacher should give assignments to students and assess them	• Graphical symbol, charts, drawing sets
<b>Assessment: The Practical class will be awarded 40% of the total score. The continuous assessments, test and quizzes will take 10% of the total score while the remaining 50 % will be for the end of the semester examination score</b>			

<b>Course: ELECTRICAL INSTALLATION OF BUILDING</b>		<b>Course Code: EEC 129</b>	<b>Contact Hours: 15 hrs lecture</b>
<b>Course Specification: Theoretical Content</b>			
<b>General Objective: 1.0 Understand the basic knowledge and skill in electrical installation of building and systems.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
1 - 2	<p>Graphic symbols</p> <p>1.1 Identify electrical/electronic graphical symbols</p> <ul style="list-style-type: none"> <li>a. Resistor</li> <li>b. Capacitor</li> <li>c. Inductor</li> <li>d. Diodes</li> <li>e. Thyristor</li> <li>f. Diac</li> <li>g. Triac</li> <li>h. Operational Amplifier</li> <li>i. Logic gates</li> <li>j. Linear IC</li> <li>k. Power Switches</li> <li>l. Sockets</li> <li>m. Isolator Switch</li> <li>n. Breakers</li> <li>o. Motors</li> <li>p. Fans</li> <li>q. ELCB.</li> </ul> <p>1.2 Draw symbols in 1.1 above using appropriate instruments.</p>	<ul style="list-style-type: none"> <li>• The teacher should show and draw electrical/electronic graphical symbols to the students.</li> </ul>	<p>Charts showing graphical symbols must be available in the laboratory.</p>
3  4 - 5	<p>Schematic and Wiring Diagrams</p> <p>2.1 Explain schematic and Wiring Diagrams</p> <p>2.2 State the merits and demerits of schematic diagrams</p> <p>2.3 Draft various schematic diagrams e.g Transistor circuits panel etc.</p> <p>2.4 Explain wiring diagram</p> <p>2.5 State the merits and demerits of wiring diagrams</p> <p>2.6 Draft various wiring diagrams.</p> <p>2.7 Explain methods of preventing hazards.</p>	<ul style="list-style-type: none"> <li>• The teacher should draft various schematic diagram for electrical/electronic circuits and panel to the students.</li> <li>• Teacher to draft various wiring diagrams to students</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Instrument and drawing boards.</li> <li>• Typical samples of architectural drawings must be available in the Lab. and workshop.</li> </ul>

Course: ELECTRICAL INSTALLATION OF BUILDING		Course Code: EEC 129	Contact Hours: 15 hrs lecture
<b>Course Specification: Theoretical Content</b>			
General Objective: 1.0 Understand the basic knowledge and skill in electrical installation of building and systems.			
Week	Specific Learning Outcome:	Teachers Activities	Resources
4 - 5	<p>2.8 Define earth continuity conductor, earth electrode, consumer's earth terminal.</p> <p>2.9 Explain the necessity for earthing and state the relevant regulations concerning earthing.</p> <p>2.10 Explain the protection of an installation by fuse and by ELCB.</p> <p>2.11 Distinguish between solid earthing practice and earth leakage circuit breaker protection.</p> <p>2.12 State a number of problems associated with earth leakage circuit breakers.</p> <p>2.13 Describe how the human body can become part of an electric circuit.</p> <p>2.14 Explain how to prevent electric shock.</p> <p>2.15 Explain methods of treating electric shock.</p> <p>2.16 Explain artificial respiration</p> <p style="padding-left: 20px;">a) mouth resuscitation</p> <p style="padding-left: 20px;">b) revised Holger Nelson resuscitation</p> <p style="padding-left: 20px;">c) external cardio compression/cardio-pulmonary resuscitation.</p>		
6 - 7	<p>Sectional and Architectural Drawing</p> <p>3.1 Explain architectural drawings and symbols</p> <p>3.2 Interpret architectural drawings</p> <p>3.3 Draft architectural drawings of simple buildings e.g 3 bedroom flat</p> <p>3.4 Produce elevation drawings from architectural drawings.</p>	<ul style="list-style-type: none"> <li>• Teacher to draft architectural drawings of simple building e.g. 3-bedroom flat.</li> </ul>	<ul style="list-style-type: none"> <li>• Chalk and Board.</li> </ul>
8 - 10	<p>Cable Sizes</p> <p>4.1 Define the following diversity factor ambient temperature, class of excess current protection, and disposition of cable</p> <p>4.2 Explain the use of relevant IEE tables for</p>	<ul style="list-style-type: none"> <li>• The teacher should show to the student various cable sizes used in wiring and services building.</li> <li>• Draw typical electrical supply</li> </ul>	<ul style="list-style-type: none"> <li>• Films</li> <li>• Computers to aid drafting. (Auto CAD)</li> </ul>

<b>Course: ELECTRICAL INSTALLATION OF BUILDING</b>		<b>Course Code: EEC 129</b>	<b>Contact Hours: 15 hrs lecture</b>
<b>Course Specification: Theoretical Content</b>			
<b>General Objective: 1.0 Understand the basic knowledge and skill in electrical installation of building and systems.</b>			
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
8 - 10	<p>cable selection.</p> <p>4.3 Apply 4.1 and 4.2 for close selection</p> <p>4.4 Design an external supply system for a 3-bedroom building</p> <p>4.5 Draft electrical services for a simple 3-bedroom building</p> <p>4.6 Calculate the total load current for a final sub circuit in the building</p> <p>4.7 List the main types of insulating and conducting materials.</p> <p>4.8 Distinguish between conductors and insulators.</p> <p>4.9 Describe, with the aid of sketches, the construction of different types of cables.</p> <p>4.10 State the advantages and disadvantages when using:</p> <ul style="list-style-type: none"> <li>a. PVE - Insulated, PVC - sheathed cables.</li> <li>b. Mineral - Insulated metal - sheathed cables</li> <li>c. Armoured PVC - insulated, PVC - sheathed cables</li> <li>d. Steel and PVC conducts</li> <li>e. Steel and PVC trunking.</li> <li>f. Flexible cabled and cord etc.</li> </ul> <p>4.11 Explain the general I.E.E. Regulation related to cables and their uses.</p> <p>4.12 Identify the cable colour coding, commonly used in Nigeria.</p> <p>4.13 Demonstrate various types of joints using PVC and flexible cables.</p>	<p>systems for building.</p>	
11 - 12	<p>Estimating Procedure</p> <p>5.1 Produce item quantities from drawings</p> <p>5.2 Assess cost of materials</p>	<ul style="list-style-type: none"> <li>• Prepare typical bills of quantities for electrical installations.</li> </ul>	

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<b>Course Specification: Theoretical Content</b>			
	<b>General Objective: 1.0 Understand the basic knowledge and skill in electrical installation of building and systems.</b>		
<b>Week</b>	<b>Specific Learning Outcome:</b>	<b>Teachers Activities</b>	<b>Resources</b>
11 - 12	5.3 Prepare typical bills of engineering measurements and materials for an electrical installation.	• Give students practices and mark them.	
13 - 15	Electronic/Electrical Systems Installation 6.1 Installation of public address system 6.2 Installation of television system 6.3 Installation of computer system 6.4 Electrical services of residential and commercial/industrial premises 6.5 Installation of single phase and three-phase energy meters in domestic and commercial/industrial premises.	• The teacher should illustrate the installation of the system with appropriate diagram and procedure.	• Samples of installation diagrams.
<b>Assessment:</b> The Practical class will be awarded 40% of the total score. The continuous assessments, test and quizzes will take 10% of the total score while the remaining 50 % will be for the end of the semester examination score			