

Electrical Engineering Technology - National Diploma (ND)

MEASUREMENT/INSTRUMENT COURSES

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Electrical/Electronics Instrumentation I

EEC 126 ELECTRICAL/ELECTRONIC INSTRUMENTS | Y1/2ND SEMESTER 1/0/3 HRS/WK

OUTCOME:

On completion of the module, the students should be able to:

1. Identify various types of electrical and electronic instruments.
2. Understand different types of error in measurement.
3. Know the features, functions and uses of moving coil instruments.
4. Know the operation of bridge circuits
5. Understand the working principle and construction of ohmmeter and megger.

Course: ELECTRICAL/ELECTRONIC INSTRUMENTS		Course Code: EEC 126	Contact Hours: 1/0/3 hrs
Course Specification : Theoretical Content			
General Objective 1.0: Understand the basic knowledge and skill in measurement and measuring instruments			
Week	Specific Learning Outcome:	Teachers Activities	Resources
1 - 2	<p>1.1 List various types of Electrical and Electronic Measurement Instruments:</p> <ol style="list-style-type: none"> a. Moving iron b. Moving Coil c. Voltmeter d. Ammeter e. Cathode ray Oscilloscope (C.R.O.) f. Megger g. Wheatstone bridge h. Wattmeter i. Digital Voltmeter j. Frequency Counters k. Clip ammeter etc. <p>1.2 Identify the instruments listed in 1.1 above</p> <p>1.3 State the applications of the instruments listed in 1.1 above</p> <p>1.4 State the range of type of each where necessary.</p>	<ul style="list-style-type: none"> • Ask students to identify the items in section 1.1 	<ul style="list-style-type: none"> • Chalkboard, Textbooks, Measuring Instruments

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Course Specification : Theoretical Content			
General Objective 1.0: Understand the basic knowledge and skill in measurement and measuring instruments			
Week	Specific Learning Outcome:	Teachers Activities	Resources
3 - 4	<p>2.1 State different types of errors</p> <p>a. Random</p> <p>b. Systematic</p> <p>c. Static</p> <p>2.2 Define the errors Stated in 2.1 above.</p> <p>2.3 Give practical examples of the errors stated in 2.1 above.</p>	<ul style="list-style-type: none"> State the types of errors in practical examples 	-do-
5 - 7	<p>3.1 Sketch the permanent magnet moving Coil Instrument</p> <p>3.2 Explain the operation of moving Coil Instrument</p> <p>3.3 Show how the moving Coil Instrument can be used as</p> <p>a. Ammeter and</p> <p>b. Voltmeter.</p> <p>3.4 Show how a multiplier and Shunt can be used to increase the range of Voltmeter and ammeter respectively.</p> <p>3.5 Calculate the Values of the multiplier and shunt.</p> <p>3.6 Calibrate a moving Coil Instrument. 3.7 Measure Voltage and Current by connecting Multiplier and Shunt respectively.</p>	<ul style="list-style-type: none"> Illustrate the operating principle with diagram(s) 	-do-
8 - 10	<p>4.1 Draw a block diagram of the following Digital Meters:</p> <p>a. Digital Voltmeter</p> <p>b. Frequency Counter</p> <p>4.2 Explain the operation of the instruments in 4.1 above.</p> <p>4.3 Use DVM to measure Voltage</p> <p>4.4 Use Frequency Counter to measure frequencies up to 100KHz</p>	<ul style="list-style-type: none"> Give the essential features of Digital Instrument 	-do-

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Course Specification : Theoretical Content			
General Objective 1.0: Understand the basic knowledge and skill in measurement and measuring instruments			
Week	Specific Learning Outcome:	Teachers Activities	Resources
11 - 13	5.1 List various types of bridge Circuit a. Wheat Stone, b. Capacitance c. Inductance. 5.2 State the industrial applications of the bridges listed in 5.1 above. 5.3 Explain the operation of the bridge circuits listed in 5.1 above. 5.4 Explain the operation of a null detector 5.5 Use Wheatstone bridge to measure resistance.	<ul style="list-style-type: none"> Ask students to explain the operation and applications of bridge circuits 	-do-
14 - 15	6.1 Sketch the diagram of Ohmmeter and Megger 6.2 Describe the Construction and Operation of the instruments in 6.1 above 6.3 Identify an earth point 6.4 Use Megger to Measure the following: a. Earth resistance and b. Insulation resistance.	<ul style="list-style-type: none"> Ask students to state the differences Ohmmeter and Megger 	-do-
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			

Course: ELECTRICAL/ELECTRONIC INSTRUMENTS I		Course Code: EEC 126	Contact Hours: 45 hrs Practical
Course Specification: Practical tasks			
General Objective 1.0 Utilize and measure electrical quantities with electrical/electronic instruments			
Week	Specific Learning Outcome:	Teachers Activities	Resources
1 - 2	1.1 Demonstrate ohm's law using variable resistance 1.2 Demonstrate ohm's law using variable e.m.f	• Ask students to verify ohm's law	• e.m.f sources, variable and fixed resistances, cables, voltmeter, ammeter
3 - 5	2.1 Determine the resistivity of materials 2.2 Determine the resistance of serial and parallel circuit 2.3 Verification of Kirchoff's current and voltage law 2.4 Demonstrate superposition theory	• Ask students to compare their results with the theory of experiment	-do-
6 - 7	3.1 Demonstrate charging and discharging of capacitors 3.2 Demonstrate charging and discharging of inductors	• The teacher should assist to charge and discharge the circuit elements	• Capacitors, inductor, e.m.f sources, voltmeter and ammeter
8 - 10	4.1 Calibrate and measure with moving coil instruments 4.2 Calibrate and measure with moving iron instrument	• The teacher should demonstrate the process of calibration with the students	• Moving coil instrument, moving iron instrument, drawing sets
11 - 13	5.1 Determine the resistance using wheatstone bridge 5.2 Demonstrate bridge circuits to measure a. inductance b. capacitance c. frequency	• Ask students to comment bridge circuit	• Wheatstone bridge and other bridge circuits
14 - 15	6.1 Measure d.c voltage in experiments using moving coil instrument 6.2 Measure a.c voltage in experiments using suitable instruments	• Involve the students in the measurement using suitable instruments	• A.C and d.c voltmeters

Course: ELECTRICAL/ELECTRONIC INSTRUMENTS I	Course Code: EEC 126	Contact Hours: 45 hrs Practical	
Course Specification: Practical tasks			
	General Objective 1.0 Utilize and measure electrical quantities with electrical/electronic instruments		
Week	Specific Learning Outcome:	Teachers Activities	Resources
	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		

Electrical/Electronics Instrumentation II

EEC 236 ELECTRICAL/ELECTRONIC INSTRUMENTS II Y2/3rd semester 1/0/2 hrs/wk

OUTCOMES:

On completion of the module, the students should be able to:

1. Understand and Utilize the cathode ray oscilloscope.
2. Know the operation and utilize wattmeters
3. Understand the factors for selection of instruments.
4. Know the importance of instrumentation in industries

Course: ELECTRICAL/ELECTRONIC INSTRUMENTS II		Course Code: EEC 236	Contact Hours: 1/0/2 hrs
Course Specification: Theoretical Content			
General Objective : Acquaint the students with operation and application of electrical/electronic instruments for laboratory and industrial measurements			
Week	Specific Learning Outcome:	Teachers Activities	Resources
1 - 4	1.1 Draw the block diagram of CRO 1.2 Explain the function of each block 1.3 Draw the diagram of Cathode Ray Tube (CRT) 1.4 Explain the operation of C.R.T. a. CRT Vertical and horizontal amplifiers b. Time base, c. Triggering d. Sweep generator 1.5 Measure D.C. Voltage with C.R.O. 1.6 Measure the following a/c. parameters using C.R.O: a. Amplitude b. Phase and c. Frequency	<ul style="list-style-type: none"> • Ask the students to draw and explain the functions of CRO's block diagram 	<ul style="list-style-type: none"> • Chalk, Board, Textbooks, Cathode ray tube, wattmeter
5 - 8	2.1 Sketch electrodynamic Power meter 2.2 Explain the operation of the meter 2.3 Explain the use of three meters and	<ul style="list-style-type: none"> • The teacher should demonstrate the use of wattmeter for power measurement 	-do-

Course: ELECTRICAL/ELECTRONIC INSTRUMENTS II		Course Code: EEC 236	Contact Hours: 1/0/2 hrs
Course Specification: Theoretical Content			
General Objective : Acquaint the students with operation and application of electrical/electronic instruments for laboratory and industrial measurements			
Week	Specific Learning Outcome:	Teachers Activities	Resources
5 - 8	two meters in measuring power in 3- Φ Circuit 2.4 Measure Power in Single phase Circuit 2.5 Measure Power in 3- Φ Circuit 2.6 Calculate Power factor.		
9 - 10	3.1 Explain the importance of the following factors in selecting measurement instruments: a. Range b. Accuracy c. Response d. Stability e. Reliability f. Sensitivity	• Ask the students to explain the fabric in selecting measurement instruments	• Chalk and board
11 - 15	4.1 Explain the importance of instrument in industries 4.2 List important measurement industries a. Pressure b. Temperature c. Level d. Flowrate e. Density f. Viscosity g. Humidity, etc. 4.3 Explain why the variables in 4.2 above are important. 4.4 Classify instruments into the following: a. Indicating b. Recording c. Controlling 4.5 Give examples of each in 4.3 above	• The teachers should emphasize on all the industrial measurements and instruments' classification	- do-

Course: ELECTRICAL/ELECTRONIC INSTRUMENTS II		Course Code: EEC 236	Contact Hours: 1/0/2 hrs
Course Specification: Theoretical Content			
General Objective : Acquaint the students with operation and application of electrical/electronic instruments for laboratory and industrial measurements			
Week	Specific Learning Outcome:	Teachers Activities	Resources
11 - 15	4.6 State the applications of Instruments in 4.3 above.		
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			

Course: ELECTRICAL/ELECTRONIC INSTRUMENTS II		Course Code: EEC 236	Contact Hours: 30hrs Practicals
Course Specification Practical tasks			
General Objective : Apply the electrical/electronic instruments for measuring electrical and physical quantities			
Week	Specific Learning Outcome:	Teachers Activities	Resources
1 - 5	1.1 Measurement of d.c voltage in experiments using CRO 1.2 Measurement of a.c voltage in experiments using CRO 1.3 Measurement of range of frequencies with CRO 1.4 Measurement of phase angles with CRO	• Ask students to take measurements during experiments	• CRO, signal generator, d.c/a.c power supplies, probe
6 - 9	2.1 Carry out experiment on d.c power measurement 2.2 Perform experiment on a.c power measurement in single phase circuit 2.3 Carry out experiment on a.c power measurement in three phase circuit 2.4 Perform experiment on power factor measurement	• The teacher should involve the students in power measurement	• Wattmeter, power supplies, single and three phase circuits
10 - 15	3.1 Perform experiment to determine temperature effect on resistance 3.2 Carry out experiment to verify temperature effect on semi conductor	• Give students experiments to perform with necessary guidance	• Resistances, semi-conductor diodes, digital thermometers, power supplies, cables

Course: ELECTRICAL/ELECTRONIC INSTRUMENTS II		Course Code: EEC 236	Contact Hours: 30hrs Practicals
Course Specification Practical tasks			
General Objective : Apply the electrical/electronic instruments for measuring electrical and physical quantities			
Week	Specific Learning Outcome:	Teachers Activities	Resources
10 - 15	diode 3.3 Measure temperature range using digital thermometer		
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			