

GANPAT UNIVERSITY										
FACULTY OF ENGINEERING & TECHNOLOGY										
Programme		Diploma Engineering				Branch		ELECTRICAL ENGINEERING		
Semester		III				Version		1.0.0.0		
Effective from Academic Year			2019-20			Effective for the batch Admitted in			June 2019	
Subject code		1EE2304		Subject Name		ELECTRICAL INSTRUMENTS				
Teaching scheme					Examination scheme (Marks)					
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total	
	L	TU	P	TW						
Credit	3	0	1	0	4	Theory	40	60	100	
Hours	3	0	2	0	5	Practical	30	20	50	

Course Learning Outcomes: Upon completion of this course, students will acquire knowledge about to:

- Know the operation of various measuring instruments.
- Use, calibrate and maintain different types of electrical instrumentation systems.
- Understanding of the construction, material used and principle of operation of various types of measuring instruments.

Course Content

Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
FUNDAMENTALS OF MEASUREMENTS	1.1 Fundamentals of measurements. 1.2 Aims of measurement. 1.3 Definition of basic terms related to measurement. 1.4 Types & sources of error.	1a. Methods of measurement 1b. Discriminate between indicating, integrating and recording, absolute and secondary instrument. 1c. Know different terms related to measurement and instruments. 1d. Difference between different types of errors with examples.	06	04
POTENTIOMETERS & BRIDGES	2.1 D.C. potentiometer, principle, working and list of applications. 2.2 Dial type potentiometer, construction and working. 2.3 Wheatstone bridge, Kelvin's double bridge and Wien bridge for resistance measurement. 2.4 Universal impedance bridge 2.5 Balanced and unbalanced bridges. 2.6 Self balancing bridges.	2a. Understand the working of DC potentiometer. 2b. Differentiate between types of potentiometers. 2c. Classify different type of resistances 2d. Understand wheatstone's bridge, Kelvin double bridge and other methods to measure low and medium resistance. 2e. Select an AC bridge to determine inductance and capacitance.	16	10
ELECTROMECHANICAL INSTRUMENTS	3.1 Classification of instruments. 3.2 Essential torques in indicating instruments.	3a. Understand the common errors in various electromechanical measuring instrument.	18	10

	<p>3.3 Construction, working, common errors and applications of</p> <ol style="list-style-type: none"> 1. P M M C instrument 2. Moving iron instrument 3. Dynamometer type watt meter 4. Energy meter 5. P.F. meter 6. Trivector meter 7. Maximum demand meter 8. Megger 9. Earth tester 10. Phase sequence indicator 11. Analog multimeter 12. Solid state energy meter 13. Clip-on meter <p>3.4 Ratio error, phase angle error and extension of range in C.T & P.T.</p>	<p>3b. Distinguish between moving iron and PMMC type instruments.</p> <p>3c. Differentiate between electro-dynamometer type and induction type meters.</p> <p>3d. To know the working of a hot wire instruments</p> <p>3e. Selection of different types of electro-mechanical instruments for different kind of measurement.</p> <p>3f. Understand the use of shunt and multipliers for range extension of ammeters and voltmeters</p> <p>3g. Illustrate the use of CT and PT for range extension of meters.</p>		
CALIBRATION & TESTING	<p>4.1 Need for calibration.</p> <p>4.2 Calibration of ammeter, Watt meter and voltmeter as per I.S.</p> <p>4.3 Calibration of single phase energy meter and its adjustments as per I.S. code.</p>	<p>4a. Justify the necessity of calibration.</p> <p>4b. State the procedure to calibrate various electrical instruments.</p>	06	05
INTRODUCTION TO TRANSDUCER.	<p>5.1 Classifications of Transducers</p> <p>5.2 Characteristics of Transducers</p> <p>5.3 Potentiometer, Strain Gauge, RTD.</p> <p>5.4 Thermistors, Thermocouple, IC Temperature Transducers.</p> <p>5.5 LVDT, RVDT.</p>	<p>5a. Understand basic requirement of transducers.</p> <p>5b. Classify different types of transducers.</p> <p>5c. Describe working principle of different types of electro-optical transducers.</p>	06	04
FUNDAMENTALS OF MEASUREMENTS	<p>1.1 Fundamentals of measurements.</p> <p>1.2 Aims of measurement.</p> <p>1.3 Definition of basic terms related to measurement.</p> <p>1.4 Types & sources of error.</p>	<p>1a. Methods of measurement</p> <p>1b. Discriminate between indicating, integrating and recording, absolute and secondary instrument.</p> <p>1c. Know different terms related to measurement and instruments.</p> <p>1d. Difference between different types of errors with examples.</p>	12	12

List of Practical		
No.	Unit	Name of Practical
1	2	TEST THE MEDIUM RESISTANCE USING WHEATSTONE BRIDGE
2	2	TEST OF RESISTANCE, INDUCTANCE AND CAPACITANCE BY USING UNIVERSAL IMPEDANCE BRIDGE
3	5	CALIBRATION OF AMMETER (MI/MC) AS PER IS
4	5	CALIBRATION OF VOLTMETER (MI/MC) AS PER IS
5	3	USE OF DC VOLTMETER FOR DIFFERENT RANGES.
6	4	CALIBRATION OF SINGLE PHASE ENERGY METER AS PER IS
7	3	MEASUREMENT OF DIFFERENT ELECTRICAL PARAMETERS WITH THE HELP OF CLIP ON METER.
8	3	MEASUREMENT OF INSULATION RESISTANCE OF A WINDING WITH THE HELP OF MEGGER.
9	6	MEASUREMENT OF DISPLACEMENT USING LVDT
10	6	USE OF THERMOCOUPLE TO CONTROL TEMPERATURE OF A ELECTRICAL KETTLE.

List of Instruments/Equipment/TrainerBoard	
1	DC POWER SUPPLY
2	WATTMETER
3	AMMETER
4	VOLTMETER
5	GALVANOMETER BREAD BOARD
6	LVDT
7	UNIVERSAL IMPEDANCE BRIDGE, LAMP LOAD

List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Electrical and Electronic instruments	A.K. Sawhney ,	Dhanpat Rai Publication
2	Electrical Measurements: fundamentals, concepts, applications	M.U. Reissland	New Age International Publication
3	A course in electronics & electrical measurement & instrumentation	J.B. Gupta	S.K. Katariya