

Subject Code: 1ET4030405	Subject Title: Electrical Instrumentation
Pre-Requisite	--

RATIONALE:

Precise measurement of the quantities such as voltage, current, power, temperature, pressure etc. is essential to operate and maintain the electrical machines and systems effectively and efficiently. Transducers and instruments are the devices which are used to measure such parameters. The electrical diploma engineer should therefore be competent to use, calibrate and maintain different types of electrical instrumentation systems and transducers used in the industry and power systems. This demands a better understanding of the construction, material used and principle of operation of various types of measuring instruments. This course is therefore designed to meet these needs and hence it is a core course for any electrical engineer.

COURSE OBJECTIVE:

The course content should be taught and implemented with an aim to develop different skills

1. To Know the operation of various measuring instruments.
2. To learn the generalized theory of Measurement of Various parameters (like Resistance, Inductance and Capacitance) which will help to know about measurement.
3. The major objective of the subject is to use the measuring instruments practically & to understand how different types of meters work and their construction.
4. To make the students familiar with the impact of various A.C bridges, Meters, Instruments.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment
4	-	2	5	60	40	20	30

DETAILS OF COURSE CONTENTS:

Sr No	Topics and Sub-topics	Total Hours	% Weightage
1	Fundamentals of Measurements 1.1 Fundamentals of Measurements. 1.2 Aim of Measurements. 1.3 Definition of Basic terms related to measurements. 1.4 Types and source of error.	06	15
2	Potentiometer and Bridges	10	20



	2.1 Construction and working of DC potentiometer, and its applications 2.2 Dial type and Crompton type. 2.3 Classification of Resistance. 2.4 Measurement of low and medium resistance 2.5 Universal Impedance Bridge. 2.6 A.C Bridges		
3	Electromechanical Instruments 3.1 Classification of Instruments. 3.2 Essential torques in indicating instruments. 3.3 Construction, working, errors and applications of ❖ PMMC instruments ❖ Moving Iron Instruments ❖ Dynamometer type instruments ❖ Energy meter (single phase, three phase) ❖ Power factor meter ❖ Trivector meter ❖ Maximum demand meter ❖ Megger ❖ Earth tester ❖ Phase Sequence Indicator ❖ Solid state energy meter ❖ Clip-on meter 3.4 Extension of range using shunt, multipliers and derive equation for them. 3.5 Extension of range of meters using instrument transformer like CT and PT	16	25
4	Calibration and Testing 4.1 Need of Calibration 4.2 Calibration of Ammeter, voltmeter and wattmeter as per I.S. 4.3 Calibration of Single phase energy meter and its adjustments as per I.S.	06	15
5	Transducers 5.1 Definition of Transducer. 5.2 Classification of Transducer. 5.3 Types of errors in Transducers. 5.4 Selection of transducers. 5.5 Resistive Transducers, inductive transducers, Capacitive Transducers, Piezo-electric transducer, Thermo-electric transducer. 5.6 Digital Transducer	18	25

	5.7 Opto-electric transducers 5.8 Applications of Transducers for Measurement of Non-electrical Quantities. ❖ Displacement ❖ Thickness ❖ Velocity ❖ Weight ❖ Pressure ❖ Liquid Level ❖ Temperature ❖ Strain ❖ PH 5.9 Basic Introduction of Sensor and its types.		
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COURSE OUTCOME:

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

1. Acquire the knowledge regarding measurement of various quantity
2. Able to carry out various experimental studies about measurement.
3. They will be capable to measure electrical quantity like resistance, inductance, capacitance, power etc. using various measuring instruments & calibrate the measuring devices such as meters.

LIST OF PRACTICAL:

- 1 Measurement of medium resistance using Wheatstone bridge.
- 2 Measurement of low resistance using Kelvin bridge.
- 3 Calibration of Ammeter (MI/MC) as per I.S
- 4 Calibration of Voltmeter (MI/MC) as per I.S
- 5 Calibration of Wattmeter as per I.S
- 6 Calibration of single phase energy meter as per I.S
- 7 Extend the range of ammeter using Shunt.
- 8 Extend the range of Voltmeter using Multiplier.
- 9 Measurement of different electrical parameters with the help of clip on meter.
- 10 Measurement of insulation resistance of a winding with the help of Megger.
- 11 Measure Linear displacement using LVDT.

LIST OF REFERENCES:

1. A.K.Sawhney , A course in Electrical & Electronic Measurement and Instrumentation,
2. J.B.Gupta- A course in Electrical& Electronic Measurement and Instrumentation.
3. M. U. Reissland - Electrical Measurements: fundamentals, concepts, applications
4. www.scientechworld.com.

5. www.electrical-electronics.co.in