

Branch Name:	Electrical Engineering
Program Code	ET403
Course Name:	Electrical Instrumentation
Course Code:	2ET4030405
Pre-requisiteCourse:	

COURSE OBJECTIVE:

1. To understand the operation of various measuring instruments.
2. To understand the generalized theory of Measurement of Various parameters (like Resistance, Inductance and Capacitance) which will help to know about measurement.
3. To understand the usage of measuring instruments and bridges practically

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& Instrumentation 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. 1.5 Classification of Instruments. 1.6 Essential torques in indicating instruments.	06	15
2	Potentiometer and Bridges 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 Kelvin's double bridge 2.5 Medium Resistance by Wheatstone bridge, Ammeter-Voltmeter method, Ohmmeter 2.4 High Resistance by Megger 2.5 Earth resistance by earth tester. 2.6 Measurement of Inductance and Capacitance by A.C Bridges 2.7 Frequency Measurement by Wein's Bridge	10	20
3	Electromechanical Instruments 3.1 Construction, working, errors and applications of ❖ PMMC instruments: Ammeter, voltmeter ❖ Moving Iron Instruments: Ammeter, Voltmeter,	16	25



	Frequency meter ❖ Dynamometer type instruments: Ammeter, voltmeter, wattmeter, power factor meter ❖ Energy meter (single phase, three phase) ❖ Hot wire instrument ❖ Power factor meter ❖ Tri-vector meter ❖ Maximum demand meter ❖ Phase Sequence Indicator ❖ Solid state energy meter ❖ Clip-on meter 3.2 Extension of range using shunt, multipliers and derive equation for them. 3.3 Extension of range of meters using instrument transformer like CT and PT		
4	Calibration and Testing 4.1 Calibration and its importance 4.2 Calibration of Ammeter, voltmeter and wattmeter (along with adjustment) as per I.S. 4.3 Calibration of Single-phase energy meter (along with adjustments) as per I.S.	06	15
5	Transducers 5.1 Basic Requirement of Transducer 5.2 Definition of Transducer. 5.3 Primary Transducer-detector and secondary transducer 5.4 Classification of Transducer Based on: Transduction Phenomenon, types of application, types of input and out put signal, electrical principle involved 5.5 Types of errors in Transducers. 5.6 Factors to be considered in the Selection of transducers. 5.7 Resistive Transducers, inductive transducers: LVDT, RVDT, Capacitive Transducers, Piezo-electric transducer, Thermo-electric transducer. 5.8 Digital Transducer 5.9 Opto-electric transducers 5.10 Applications of Transducers for Measurement of Non-electrical Quantities. ❖ Displacement ❖ Thickness ❖ Velocity ❖ Weight ❖ Pressure ❖ Liquid Level ❖ Temperature ❖ Strain ❖ PH 5.11 Basic Introduction of Sensor and its types.	18	25

REFERENCE BOOKS:

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

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.

Course Learning Outcomes (CLO):

CLO	Description	Bloom's Taxonomy Level
CLO1	Discuss the knowledge on fundamentals of measuring system.	2 Understanding
CLO2	List the various experimental studies about measurement.	1 Remembering
CLO3	Acquire fundamentals and translate the knowledge that will enable for measurement.	2 Understanding,
CLO4	Learn basic techniques to identify and interpret for measurement of different quantity.	3 Applying, 2 Understanding
CLO5	Learn about calibration and evaluate the errors in instruments.	5,3, 4 EvaluateApplying, Analyze
CLO6	Discuss the methods for calibration.	6 Creating

Mapping of CLOs with Pos & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	H				M			L		L			H	L	L
CLO2	L				M								H	M	L
CLO3	L												L		M
CLO4					L			L					M		M
CLO5					L								M		
CLO6													L	L	

H:High, M:Medium, L:Low