MEASUREMENTS AND INSTRUMENTATION

Course Code	20EE3401	**Year**	II	**Semester**	II
Course Category	Professional Core	**Branch**	EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Basics of Electrical Engineering
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the basic concepts of measuring instruments. (L2)
CO2	**Apply** the basic knowledge to determine electrical quantities using various measuring instruments and bridges.(L3)
CO3	**Apply** the basic knowledge to measure physical and electrical quantities using various transducers and digital meters (L3)
CO4	**Analyze** the operation of measuring instruments, DC and AC bridges for measurement of electrical Quantities (L4)
CO5	**Analyze** the operation of transducers and digital meters for measuring physical and electrical quantities (L4)
CO6	**Submit a report** on operation of measuring instruments, instrument transformers, transducers, DC and AC bridges.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3												2	1
CO3	3												2	1
CO4		3											2	1
CO5		3											2	1
CO6									3	3			2	1

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	Classification, deflecting, control and damping torques, Ammeters and Voltmeters, PMMC, moving iron type instruments, expression for deflecting torque and control torque, errors and compensations. Instrument Transformers: Current Transformers and Potential Transformers-theory, ratio error and phase angle error.(only theory no problems)	CO1 CO2 CO4 CO6
II	Single phase dynamometer wattmeter, LPF and UPF, three phase power measurement by two wattmeter method, Single phase induction type energy meter, driving and braking torques. Electrodynamometer and Moving Iron Power Factor meters.	CO1 CO2 CO4 CO6
III	Measurement of resistances using Wheat stone's bridge, Kelvin's double bridge, and megger. Measurement of inductance using Maxwell's bridge, Hay's bridge, Anderson's bridge, Measurement of capacitance using	CO1 CO2 CO4

	Schering Bridge.	CO6
IV	Classification of transducers, Resistive, Inductive and Capacitive Transducer, Strain Gauge, Thermistors, Thermo couples, Linear Variable Differential Transformers, Piezo electric Transducer.	CO1 CO3 CO5 CO6
V	Digital Voltmeters-Successive approximation, ramp and integrating type DVM, Digital frequency meter, Digital multimeter, Digital energy meter, wave analyzer, spectrum analyzer, power analyzer.	CO1 CO3 CO5 CO6

Learning Resources

Text Books

1. A course in Electrical and Electronic Measurements and Instrumentation by A.K. Sawhney, 9th Edition, Dhanpat Rai & Co. Publications.
2. Electrical Measurements and Measuring Instruments, E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publishing company.

Reference Books

1. Electrical Measurements: Fundamentals, Concepts, Applications by Martin. U. Reissland, New Age International Publishers Limited.
2. Electrical and Electronic Measurements by G.K.Banerjee, PHI Learning Private Ltd.

e- Resources

1. https://nptel.ac.in/courses/108/105/108105153/