

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Course Code	23EE3601	Year	III	Semester	II
Course Category	Professional Core	Branch	EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	BEEE
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 knowledge to measure electrical and physical quantities using various measuring instruments, transducers and digital meters. (L3)
CO3	Apply the knowledge to measure different parameters using Smart instruments, SCADA and solar instruments. (L3)
CO4	Analyze the operational concepts of measuring instruments, transducers and digital meters. (L4)
CO5	Analyze the operational concepts of Smart instruments, SCADA and solar instruments. (L4)
CO6	Capability to understand the concepts of measuring instruments, instrument transformers, transducers, digital meters, Smart instruments, SCADA and solar instruments and submit a report

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	2	1
CO3	3											2	2	1
CO4		3										2	2	1
CO5		3										2	2	1
CO6									3	3			2	1

SYLLABUS		
Unit No.	Contents	Mapped CO
I	Measuring Instruments and Instrument transformers Electrodynamometer type wattmeter (LPF and UPF), Power factor meters: Dynamometer and M.I type (Single phase and three phase) – Construction – torque equation – advantages and disadvantages. Instrument transformers: Current Transformer and Potential Transformer – theory –Ratio and phase angle errors.	CO1 CO2 CO4 CO6
II	Transducers Definition –Classification – Resistive, Inductive and Capacitive Transducer – LVDT – Strain Gauge – Thermistors – Thermocouples – Piezo electric and	CO1 CO2

	Photo Diode Transducers – Hall effect sensors	CO4 CO6
III	Digital Meters Digital Voltmeters – Successive approximation DVM – Ramp type DVM and Integrating type DVM – Digital frequency meter – Digital multimeter – Digital tachometer – Digital Energy Meter – Q meter – Power analyzer.	CO1 CO2 CO4 CO6
IV	Smart instruments Intelligent transducer – self-diagnosis and remote calibration features, HART communication, Micro Electro Mechanical Systems (MEMS); Advanced Metering Infrastructure (AMI) environments – smart energy meter components, working principle; Automatic Meter Reading (AMR)	CO1 CO3 CO5 CO6
V	SCADA Introduction, Block Diagram, Components of SCADA, Functions of SCADA, PMUs (Phasor Measurement Units) and IEDs (Intelligent Electronic Devices) Solar Instrumentation: Instruments for measuring solar radiation – pyranometers, pyrhelimeter, measurement of sunshine – sunshine recorder.	CO1 CO3 CO5 CO6

Learning Resources	
Text Books:	
1. A course in Electrical and Electronic Measurements and Instrumentation by A.K. Sawhney, 9 th Edition, Dhanpat Rai & Co. Publications. 2. Transducers and Instrumentation, by Murthy. D.V.S, PHI, second edition.2008	
Reference Books:	
1. Digital Instrumentation by Bowens A.J., Tata Mc-Graw Hill, 1996. 2. Intelligent Instrumentation by Barney G.C.V., Prentice Hall of India Pvt. Ltd., New Delhi, 1988. 3. SCADA: Supervisory Control and Data Acquisition by Stuart A. Boyer, Fourth edition, International Society of Automation, 2010 4. Non-Conventional Energy Sources by G.D. Rai, Khanna publishers, 5th edition,2014.	
E-Resources:	
1. https://archive.nptel.ac.in/courses/108/105/108105064/	