

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

IV Semester: EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEE107	Core	L	T	P	C	CIE	SEE	Total
		-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45			Total Classes: 45			

OBJECTIVES:

The course should enable the students to:

- I. Understand various measurement techniques used in electrical engineering
- II. Analyse waveforms using LabVIEW to measure various parameters.
- III. Demonstrate the use of sensors and transducers in electrical and nonelectrical measurements.
- IV. Apply knowledge of virtual instruments in measurement of analysis of electrical parameters

COURSE LEARNING OUTCOMES (CLOs)

At the end of the course, the student will have the ability to:

1. Analyze temperature measurement using transducers like thermocouple, thermistors and resistance temperature detector
2. Understand Distance measurement using ultrasonic transducer and measurement of level using capacitive transducer
3. Understand Strain measurement using strain gauge and Measurement of pressure using differential pressure transducer
4. Understand Measurement of position using encoder and Measurement of displacement using linear variable differential transformer
5. Analyze phantom loading method and compare the power consumed with direct loading
6. Analyze testing of single phase induction type energy meter and power factor meter
7. Understand calculation of turns ratio of transformer by using A.C bridge
8. Understand measurement of 3 - phase reactive power using single phase wattmeter
9. Understand Study of bidirectional energy measurement using net metering.
10. Determination of frequency and Total Harmonic Distortion (THD) using LabVIEW.
11. Analyze measurement of voltage and current waveforms using LabVIEW
12. Analyze Measurement of real and reactive powers of an electrical load using two wattmeter method and verification using LabVIEW
13. Understand measurement of energy using a static energy meter and verification using LabVIEW.
14. Understand Resistance measurement using Kelvin's double bridge; Inductance measurement using Anderson bridge and capacitance measurement using Schering bridge and verification using LabVIEW

LIST OF EXPERIMENTS	
Week-1	SENSING OF TEMPERATURE AND SPEED
Measurement of temperature using transducers like thermocouple, thermistors and resistance temperature detector with signal conditioning; Speed measurement using proximity sensor	
Week-2	CALCULATION OF DISTANCE AND LEVEL
Distance measurement using ultrasonic transducer; Measurement of level using capacitive transducer	
Week-3	MEASUREMENT OF STRAIN AND PRESSURE
Strain measurement using strain gauge; Measurement of pressure using differential pressure transducer.	
Week-4	MEASUREMENT OF POSITION AND LINEAR DISPLACEMENT
Measurement of position using encoder; Measurement of displacement using linear variable differential transformer	
Week-5	PHANTOM LOADING ON LPF WATTMETER
To calibrate LPF wattmeter by phantom loading method and compare the power consumed with direct loading	
Week-6	CALIBRATION OF SINGLE PHASE ENERGY METER AND POWER FACTOR METER
To calibrate and testing of single phase induction type energy meter and power factor meter	
Week-7	MEASUREMENT OF TURNS RATIO AND APPLICATION OF CTS
To find the turns ratio of transformer by using A.C bridge	
Week-8	MEASUREMENT OF REACTIVE POWER
To measure 3 - phase reactive power using single phase wattmeter	
Week-9	NET METERING
Study of bidirectional energy measurement using net metering.	
Week-10	MEASUREMENT OF FREQUENCY AND THD USING DIGITAL SIMULATION
Determination of frequency and Total Harmonic Distortion (THD) using LabVIEW	
Week-11	ANALYSIS OF ALTERNATING QUANTITIES USING DIGITAL SIMULATION
Measurement and display of voltage and current wave forms and analysis of waveforms using LabVIEW.	
Week-12	TWO WATTMETER METHOD USING DIGITAL SIMULATION
Measurement of real and reactive powers of an electrical load using two wattmeter method and verification using LabVIEW	
Week-13	WORKING OF STATIC ENERGY METER USING DIGITAL SIMULATION
Measurement of energy using a static energy meter and verification using LabVIEW	
Week-14	MEASUREMENT OF PASSIVE PARAMETERS USING AC AND DIGITAL SIMULATION DC BRIDGES USING
Resistance measurement using Kelvin's double bridge; Inductance measurement using Anderson bridge and capacitance measurement using Schering bridge and verification using LabVIEW	
Text Books:	
<ol style="list-style-type: none"> 1. A K Sawhney, "Electrical and Electronic measurement and instruments", Dhanpat Rai and Sons publications, 2002 2. E W Golding and F C Widdis, "Electrical measurements and measuring instruments" Wheeler publishing, 5th Edition, 2006 	

Reference Books:

1. Buckingham and Price, "Electrical measurements", Prentice Hall, 1st Edition, 2000.
2. D V S Murthy, "Transducers and Instrumentation", Prentice Hall of India, 2nd Edition, 2009.

Web References:

1. https://www.gnindia.dronacharya.info/EEEDept/Downloads/Labmanuals/EMI_Lab.pdf<https://www.scribd.com/doc/25086994/electrical-measurements-lab>
2. <https://www.scribd.com/doc/25086994/electrical-measurements-lab>