Program: **Diploma in Electrical & Electronics Engineering**	
Course Code: **3037**	Course Title: **Electrical Measurements lab**
Semester : **3**	Credits: **1.5**
Course Category: **Program Core**	
Periods per week: **3 (L:0 T:0 P:3)**	Periods per semester: **45**

Course Objectives:

- To select suitable measuring instruments.
- To familiarize with the modern measuring instruments and their operation
- To comprehend different methods of measurements for resistance, inductance and capacitance
- To know wattmeter and energy meter calibrations.

Course Prerequisites:

Topic	Course code	Course name	Semester
Basic knowledge about the elements of Electrical Engineering, Electrical circuits, and Analog Electronics		Fundamentals of Electrical and Electronics	2

Course Outcomes:

On completion of the course, the students will be able to:-

COn	Description	Duration (Hours)	Cognitive Level
CO1	Identify the functions of various types of electrical measuring instruments.	3	Applying
CO2	Develop electric circuits for verifying different network theorems.	9	Applying
CO3	Apply standard procedures for the measurement of resistance, inductance and capacitance.	12	Applying
CO4	Apply various methods for power measurements in AC circuits and examine the calibration of meters.	15	Applying
	Lab Exam	6	

CO-PO Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1				3			
CO2				3			
CO3				3			
CO4			3	3			

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline

Module Outcome	Description	Duration (Hours)	Cognitive Level
CO1	**Identify the functions of various types of electrical measuring instruments.**		
M1.01	Sketch the front panel of the measuring instruments and document meter details (MC/MI Voltmeter and Ammeter, UPF/LPF Wattmeter, Energy meter).	2	Understanding
M1.02	Experiment with a single phase / three phase electronic energy meter to record the energy consumption.	1	Applying
CO2	**Develop electric circuits for verifying different network theorems.**		
M2.01	Apply Ohm's law to measure unknown resistance in a circuit.	3	Applying
M2.02	Develop a circuit to verify Kirchhoff's laws.	3	Applying
M2.03	Develop a circuit to verify superposition theorem.	3	Applying
CO3	**Apply standard procedures for the measurement of resistance, inductance and capacitance.**		
M3.01	Develop a circuit to measure low/medium resistance using Kelvin's double bridge / Wheatstone's bridge	3	Applying

M3.02	Select suitable procedures to determine the hot and cold resistance of an incandescent lamp.	3	Applying
M3.03	Develop a circuit to measure impedance, inductance, resistance and power factor of a coil.	3	Applying
M3.04	Develop a circuit to measure the impedance, resistance, inductance, capacitance of RLC series circuit.	3	Applying
CO4	**Apply various methods for power measurements in AC circuits and examine the calibration of meters.**		
M4.01	Apply three voltmeter/ammeter method to calculate power and power factor of single phase load.	3	Applying
M4.02	Apply two wattmeter method for measurement of power and power factor of a three phase load.	3	Applying
M4.03	Develop a circuit to calibrate a wattmeter by direct loading at UPF.	3	Applying
M4.04	Develop a circuit to calibrate a single phase energy meter by direct loading at UPF.	3	Applying
M4.05	Develop a circuit to calibrate a wattmeter/ energy meter at UPF by phantom loading.	3	Applying
	Lab Exam II	3	

Text / Reference:

T/R	Book Title/Author
T1	Laboratory Manuel on Electrical Measurements & Electrical Machines, P.O.Kuttappan, Spades publishers
R1	Electrical Measurements & measuring instruments by A.K.Sawhney DhanpatRai Publications
R2	Electrical Measurements & measuring instruments by R.K.Rajput, S.CHAND Publications
R3	Electronic Measurements & instrumentation by R.K.Rajput, S.CHAND Publications

R4	Electrical Measurements & measuring instruments By G.K.BanerjeePHI Publications

Online Resources:

Sl.No	Website Link
1	Virtual Lab: http://vlabs.iitkgp.ernet.in/asnm/#
2	https://nptel.ac.in/course.html
3	https://www.electrical4u.com/electrical-engineering-articles/measurement/
4	www.youtube.com
5	https://www.allaboutcircuits.com/

Student Activity

Suggested Open-ended Experiments:

Students can do open ended experiments as a group of 3-5. There is no duplication in experiments between groups. This is mainly for the purpose of continuous internal evaluation and a score of 15 marks. Students should prepare a separate report on the open ended experiment of their choice.

Example: 1. Calibrate the instruments in the laboratory and identify the error chart.