COURSE CONTENT

ELECTRICAL MEASUREMENTS AND SENSORS LAB

II Semester: EEE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
2540278	Core	0	0	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 30				Total Classes:30		

Co requisites: **Electrical Measurements and Sensors**

Course Overview:

This laboratory course focuses on calibration, testing, and application of electrical measuring instruments and sensors. It covers measurement of electrical parameters, bridge methods, CT/PT testing, energy and power measurement, and transducer-based measurements for accurate and reliable instrumentation practices.

Course Objectives:

1. To understand the working principles of various analog measuring instruments and their torque mechanisms.
2. To learn the operation and applications of potentiometers and instrument transformers for accurate measurements.
3. To analyze the methods of measuring electrical power and energy using different types of meters.
4. To evaluate the performance of DC and AC bridges for measuring resistance, inductance, and capacitance.
5. To explore various sensors and smart instrument technologies used in modern measurement systems.

Course Outcomes: After Completion of the Course, Students should be able to

1. Explain the operation and torque mechanisms of analog measuring instruments.
2. Describe the principles and applications of potentiometers and instrument transformers.
3. Apply methods for measuring electrical power and energy using wattmeter and energy meter.
4. Compare different bridge circuits used for measuring resistance, inductance, and capacitance.
5. Identify various sensors and smart instrument systems used in modern measurement applications.

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and testing of single-phase energy Meter.
2. Calibration of dynamometer power factor meter.
3. Crompton DC Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric testing of oil using HT Testing Kit.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 - Phase reactive power with single-phase wattmeter.
8. Measurement of displacement with the help of LVDT.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:

1. Calibration LPF wattmeter – by Phantom testing.
2. Measurement of 3-phase power with single watt meter and two CTs.
3. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given CT by Null method.
4. PT testing by comparison – V. G. as Null detector – Measurement of % ratio error and phase angle of the given PT
5. Resistance strain gauge – strain measurements and Calibration.
6. Transformer turns ratio measurement using AC bridges.
7. Measurement of % ratio error and phase angle of given CT by comparison.
8. Demonstration of different sensors using trainer kit.

Proposed open ended experiments:

1. Lead-Lag Compensator Design for EV Motor Drive using digital simulation.

TEXT BOOKS:

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co.Publications, 2005.
2. Dr. Rajendra Prasad, "Electrical Measurements & Measuring Instruments", Khanna Publishers 1989.

REFERENCE BOOKS:

1. G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016.
2. R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.
3. S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.
4. Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.
5. Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.
6. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.

ELECTRONIC RESOURCES:

1. **https://nptel.ac.in/**
2. **https://www.allaboutcircuits.com/**
3. **https://electrical-engineering-portal.com/**
4. **https://ocw.mit.edu/**
5. **https://www.mathworks.com/help**

MATERIALS ONLINE:

1. Lab Manual
1. Open-ended experiments