

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EEL201	CIRCUITS AND MEASUREMENTS LAB	PCC	0	0	3	2

**Preamble** : This laboratory course is designed to train the students to familiarize and practice various measuring instruments and different transducers for measurement of physical parameters. Students will also be introduced to a team working environment where they develop the necessary skills for planning, preparing and implementing basic instrumentation systems.

**Prerequisite** : Basic Electrical Engineering

**Course Outcomes** : After the completion of the course the student will be able to

CO 1	Analyse voltage current relations of RLC circuits
CO 2	Verify DC network theorems by setting up various electric circuits
CO 3	Measure power in a single and three phase circuits by various methods
CO 4	Calibrate various meters used in electrical systems
CO 5	Determine magnetic characteristics of different electrical devices
CO 6	Analyse the characteristics of various types of transducer systems
CO 7	Determine electrical parameters using various bridges
CO 8	Analyse the performance of various electronic devices for an instrumentation systems and, to develop the team management and documentation capabilities.

#### Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2						2			3
CO 2	3	3	-	-	-	-	-	-	2	-	-	3
CO 3	3	3	-	-	-	-	-	-	2	-	-	3
CO 4	3	3	2	-	-	-	-	-	2	-	-	3
CO 5	3	3	-	-	-	-	-	-	2	-	-	3
CO 6	3	3	2	-	-	-	-	-	2	-	-	3
CO 7	3	3	-	-	-	-	-	-	2	-	-	3
CO 8	3	3	3	3	2	-	-	-	3	3	3	3

#### ASSESSMENT PATTERN:

##### Mark distribution:

Total Marks	CIE marks	ESE marks	ESE Duration
150	75	75	3 hours

##### Continuous Internal Evaluation (CIE) Pattern:

Attendance	Regular Lab work	Internal Test	Course Project	Total
15	30	25	5	75

Internal Test Evaluation (Immediately before the second series test)

**End Semester Examination (ESE) Pattern:**

The following guidelines should be followed regarding award of marks

- |  |            |
|--|------------|
| (a) Preliminary work   | : 15 Marks |
| (b) Implementing the work/Conducting the experiment                              | : 10 Marks |
| (c) Performance, result and inference (usage of equipments and trouble shooting) | : 25 Marks |
| (d) Viva voce  | : 20 marks |
| (e) Record   | : 5 Marks  |

**General instructions** : Practical examination is to be conducted immediately after the second series test after conducting 12 experiments from the list of experiments given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

**LIST OF EXPERIMENTS:**

**(12 experiments are mandatory)**

1. Verification of Superposition theorem and Thevenin's theorem.
2. Determination of impedance, admittance and power factor in RLC series/ parallel circuits.
3. 3-phase power measurement using one wattmeter and two-wattmeter methods, and determination of reactive/apparent power drawn.
4. Resistance measurement using Kelvin's Double Bridge and Wheatstone's Bridge and extension of range of voltmeters and ammeters.
5. Extension of instrument range by using Instrument transformers(CT and PT)
6. Calibration of ammeter, voltmeter, wattmeter using Potentiometers
7. Calibration of 1-phase Energy meter at various power factors (minimum 4 conditions)
8. Calibration of 3-phase Energy meter using standard wattmeter
9. Determination of B-H curve,  $\mu$ -H curve and  $\mu$ -B curve of a magnetic specimen
10. Measurement of Self inductance, Mutual inductance and Coupling coefficient of a 1-phase transformer
11. a. Measurement of Capacitance using AC bridge  
b. Setup an instrumentation amplifier using Opamps.
12. Determination of characteristics of LVDT, Strain gauge and Load-cell.
13. Determination of characteristics of Thermistor, Thermocouple and RTD
14. Verification of loading effect in ammeters and voltmeters with current measurement using Clamp on meter.

**15. Demo Experiments/Simulation study:**

- (a) Measurement of energy using TOD meter
- (b) Measurement of electrical variables using DSO
- (c) Harmonic analysers
- (d) Simulation of Circuits using software platform
- (e) Computer interfaced measurements of circuit parameters.

**Mandatory Group Project Work :** Students have to do a mandatory micro project (group size not more than 5 students) to realise a functional instrumentation system. A report also is to be submitted. Performance can be evaluated along with the internal test and a maximum of 5 marks shall be awarded.

Example projects (Instrumentation system with sensors, alarm, display units etc)

- 1. Temperature Monitoring System.
- 2. Gas / Fire smoke Detection Systems.
- 3. Simulation using LabVIEW, PLC or Similar Softwares.

**Reference Books:**

- 1. A. K. Sawhney: A course in Electrical and Electronic Measurements & Instrumentation, Dhanpat Rai Publishers
- 2. J. B. Gupta: A course in Electrical & Electronic Measurement & Instrumentation., S. K. Kataria & Sons Publishers
- 3. Kalsi H. S.: Electronic Instrumentation, 3/e, Tata McGraw Hill, New Delhi.

Estd.



2014