Basic Electrical Engineering (BEE) Lab
(for ECE, CSE,ME,BME)

SEMESTER-I or II

Suggested List of Laboratory Experiments/Demonstrations:

Dem1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

Exp1. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).

Exp 2. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.

Exp 3. Transformers: Observation of the no-load current waveform on an oscilloscope (nonsinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics).

Exp 4. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.

Exp 5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line- line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side.

Exp 6. Cumulative three-phase power in balanced three-phase circuits.

Dem2. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.

Exp 7. Torque Speed Characteristic of separately excited dc motor.

Exp 8. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections.

Note:

(i) List of Experiments and Demonstrations suggested above are already available in the Laboratory of the electrical department. No need to purchase any extra equipment except Demonstration2 equipments

(ii) Procurement of Demonstration2 equipments can be done during the course work of that semester. It can be included in the laboratory.

Exp 9.Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super synchronous speed.

Exp 10. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.

Dem3. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switch gear.

Note:

(i) Experiments 9 ,10 and Demonstration3 can be incorporated in the Lab syllabus if the topics concerned to the above experiments are considered in new BEE syllabus .

(ii) Sufficient time (At least four months to be provided for procuring these equipments)

Text / References:

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

Laboratory Outcomes: The students are expected to

☐ Get an exposure to common electrical components and their ratings.

☐ Make electrical connections by wires of appropriate ratings.

☐ Understand the usage of common electrical measuring instruments.

☐ Understand the basic characteristics of transformers and electrical machines.

☐ Get an exposure to the working of power electronic converters.