



## SEMESTER-II

### PHYSEC151

#### PART-A: ELECTRICAL CIRCUITS AND SAFETY

Marks = 100 [ESE (50) IT (20) LAB (30)]

Contact Hours: 30

*Course objective: The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode.*

#### **Unit 1:**

**Basic Electricity Principles:** Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel and series-parallel combinations of resistances and voltages. KCL & KVL. AC Electricity and DC Electricity. Electrical load and its types with examples. Introductory idea of amplitude, instantaneous value, cycle, Time period, frequency, phase angle, Phase difference. **(6 Lectures)**

#### **Unit 2:**

**Electrical Wiring Components:** Wiring materials and its types with examples. Different types of conductors and cables. Basics of wiring-Star and delta connection. Various wiring Accessories like Switches (1 way, 2 way and Intermediate), Holder, ceiling rose, Socket plug, Main switch. Advantages & disadvantages of casing-capping wiring. Advantages and disadvantage of conduit wiring and concealed wiring. **(6 Lectures)**

#### **Unit 3:**

**Electrical Drawing and Symbols:** Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Power factor. Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Reading of circuit schematics.

**Generators and Transformers:** DC Power sources. AC/DC generators. Inductance, capacitance and impedance. Operation of transformers. **(7 Lectures)**

#### **Unit 4:**

**Electric Motors:** Single-phase and three-phase AC motors. Basic design. Speed & power of ac motor.

**Solid State Devices:** Resistors, inductors and capacitors. Response of inductors and capacitors with DC or AC sources. Diode, half & full wave rectifiers, filter circuits. LED. **(5 Lectures)**

#### **Unit 5:**

**Electrical Hazards and safety:** Hazards of electricity and its various types, effects of electricity on the human body, Types of Overcurrent (Overload and fault), Protective devices such as Fuses, Circuit breakers, MCB, RCCB & DP isolator along with their functions. Concept of grounding, short circuit and its prevention. **(6 Lectures)**



**LAB: PART-B: 30 hours. (Practical/Project/ Field work):**

*Following are the lists of practicals:*

1. To use digital multimeter for measuring voltages, currents, resistances.
2. To measure the phase difference and frequency using CRO.
3. To study the LCR bridge and determine the value of given components.
4. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
5. To observe the limitations of a multimeter for measuring high frequency voltage and currents.

***Expected learning outcomes:** At the end of this course the students are expected to get acquainted with the theoretical knowledge on various electrical circuits and their safety measures along hands-on learning.*

**Reference Books:**

- i. A text book in Electrical Technology - B L Theraja - S Chand & Co.
- ii. A text book of Electrical Technology - A K Theraja.
- iii. Performance and design of AC machines - M G Say ELBS Edn.
- iv. [https://www.ittechoudwar.org/upload/1st\\_sem\\_Basic\\_Electrical.pdf](https://www.ittechoudwar.org/upload/1st_sem_Basic_Electrical.pdf)
- v. <https://www.labtrain.noaa.gov/osha600/refer/menu12a.pdf>