Course code: **18ESCEE02** Category: **Engineering Science Course**

Course title : **Basic Electrical Engineering (Theory & Lab.)**

Semester –I

[L : 3; T:1; P : 0 (4 credits)]

Detailed contents:

Module 1 : DC Circuits (10 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, analysis of simple circuits with dc excitation. Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits (10 hours)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

Module 3: Transformers (9 hours)

Magnetic materials , BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections. (Qualitative Approach)

Module 4: Electrical Machines (9 hours)

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristics and speed control of separately excited dc motor. Construction and working of synchronous generators. (Qualitative Approach)

Module 5: Electrical Installations (7 hours)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text / Reference Books

(i) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.

(ii) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

(iii) L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.

(iv) E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

(v) V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Course Outcomes

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of transformers and rotating electrical machines
- To introduce the components of low voltage electrical installations