BASIC ELECTRICAL ENGINEERING
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – I/II

Course Code	18ELE13/18ELE23	CIE Marks	40
Number of Hours/Week	2Lectrue +1Tutorial	SEE Marks	60
Total Number of Lecture Hours	40	Exam Hours	03

Credits – 03

Lecture hours per module: Six hours and Tutorials per module: one of 2 hours

Course Objectives:

- To explain Ohm's law and Kirchhoff's laws used for the analysis of DC circuits.
- To explain fundamentals of AC circuits and the behaviour of R, L and C and their combinations in AC circuits.
- To discuss three phase balanced circuits.
- To explain principle of operation, construction and performance of electrical machines such as single phase transformer, DC machines, synchronous generator and three phase induction motor.
- To introduce concepts of electrical wiring, circuit protecting devices and earthing.

Module – 1

D.C.Circuits: Ohm's Law and Kirchhoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources. Power and Energy.

A.C. Fundamentals: Generation of sinusoidal voltage, frequency of generated voltage, definition and numerical values of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities.

Revised Bloom's Taxonomy Levels	L_1- Remembering, L_2- Understanding, L_3 – Applying, L_4 – Analysing.

Module – 2

Single Phase Circuits: Analysis, with phasor diagram, of circuits with R, L, C, R-L, RC, R-L-C for series and parallel configurations. Real power, reactive power, apparent power and power factor.

Three Phase circuits:Advantages of 3-phase power, Generation of 3-phase power, Three-phase balanced circuits, voltage and current relations in star and delta connections. Measurement of three phase power using two wattmeter method.

Revised Bloom's Taxonomy Levels	L_1- Remembering, L_2- Understanding, L_3 – Applying, L_4 – Analysing

Module – 3

Single Phase Transformers: Necessity of transformer, Principle of operation, Types and construction of transformers. emf equation, losses, variation of losses with respect to load, efficiency, Condition for maximum efficiency.

Domestic Wiring: Service mains, meter board and distribution board. Brief discussion on concealed conduit wiring. Two-way and three-way control. Elementary discussion on circuit protective devices: Fuse and Miniature Circuit Breaker (MCB's),electric shock, precautions against shock. Earthing: Pipe and Plate earthing.

Revised Bloom's Taxonomy Levels	L_1- Remembering, L_2- Understanding, L_3 – Applying

Module – 4

DC Generators: Principle of operation, Construction of D.C. Generators. Expression for induced emf,Types of D.C. Generators,Relation between induced emf and terminal voltage.

DC motors: Principle of operation,Back emf,Torque equation, Types of dc motors, Characteristics of dc motors (shunt and series motors only) and Applications.

Revised Bloom's Taxonomy Levels	L_1- Remembering, L_2- Understanding, L_3 – Applying,

	Module – 5		
	Three Phase Synchronous Generators: Principle of operation, Constructional details, Synchronous speed, Frequency of generated voltage, emf equation, Concept of winding factor (excluding the derivation and calculation of distribution and pitch factors). **Three Phase Induction Motors:** Principle of operation, Generation of rotating magnetic field, Construction and working of three-phase induction motor, Slip and its significance. Necessity of starter, star-delta starter.		

Revised Bloom's Taxonomy Levels	L_1- Remembering, L_2- Understanding, L_3 – Applying.

Course Outcomes: At the end of the course the student will be able to:
- Analyse D.C and A.C circuits.
- Explain the principle of operation andconstruction of single phase transformers.
- Explain the principle of operation andconstruction of DC machines and synchronous machines.
- Explain the principle of operation and construction of three phase induction motors.
- Discuss concepts of electrical wiring, circuit protecting devices and earthing.

Graduate Attributes (As per NBA): Engineering Knowledge, Problem Analysis.

Question paper pattern:
- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

Text Books:

1	Basic Electrical Engineering	D C Kulshreshtha	Tata McGraw Hill, Revised First Edition
2	Principles of Electrical Engineering & Electronics	V.K. Mehta, Rohit Mehta	S.ChandPublications

Reference Books:

1	Fundamentals of Electrical Engineering and Electronics	B. L. Theraja	S. Chand & Company Ltd, Reprint Edition 2013.
2	Electrical Technology	E. Hughes	International Students 9th Edition, Pearson, 2005
3	Basic Electrical Engineering	D. P. Kothari and I. J. Nagrath	Tata McGraw Hill, 2017.