I/II Semester			
BASIC ELECTRICAL ENGINEERING			
Course Code	21ELE13/21ELE23	CIE Marks	50
Teaching Hours/Week (L: T:P)	(2:2:0)	SEE Marks	50
Credits	03	Exam Hours	03

Course objectives:

1) To explain the laws used in the analysis of DC and AC circuits.
2) To explain the behavior of circuit elements in single-phase circuits.
3) To explain the generation of three-phase power and operation of three-phase circuits.
4) To explain the construction and operation of transformers, DC generators and motors, inductionmotors, and synchronous generators.
5) To explain electric transmission and distribution, electricity billing and, equipment, and personalsafety measures.

Module - 1

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits excited by independent voltage sources. Power and energy, maximum power transfer theorem appliedto the series circuit and its applications.

Single-phase circuits: Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form, and peak factors. Voltage and current relationship, with phasor diagrams, in R, L, and C circuits.

Teaching-Learning Process	Chalk and talk method.

Module - 2

Single-phase circuits (continued): Analysis of R-L, R-C, R-L-C Series and Parallel circuits, Real power, reactive power, apparent power, and Power factor. Measurement of power.

Three-phase circuits: Generation of three-phase power, representation of balanced star (3 wire and 4 wire system) and delta connected loads, the relation between phase and line values of voltage and current from phasor diagrams, advantages of three-phase systems. Measurement of three-phase powerby two-wattmeter method.

Teaching-Learning Process	Single-phase circuits: Chalk and talk, Three-phase circuits: (i) For a generation of 3-phase power, video/animation areused. Numerical problems can be solved with the chalk and talk method. (ii) Practical Topics: Relation between the line and phase parameter in 3-phase connection both delta and Star connections, Power measurement in the 3-phase circuit.

Module - 3

DC Machines: (a) Principle of operation, constructional details, induced emf expression, types of generators, and the relation between induced emf and terminal voltage.

(b) Principle of operation, back emf and torque equations, types of motors, characteristics (shunt andseries only), and applications.

Transformers: Necessity of transformer, the principle of operation, Types, and construction of single-phase transformers, emf equation, losses, variation of losses with respect to load, efficiency, and condition for maximum efficiency.

Teaching-Learning Process	DC Machines: Cut out demo/actual machine module, video for working of machine, chalk, and talk. Transformer topic: Demo modules, actual machine cut-out module and chalk and talk method of teaching, YouTube videos.

Module – 4	
Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor, slip and problems on the slip, significance of slip, applications. **Three-phase synchronous generators:** Principle of operation, constructional details of salient and non-salient pole generators, synchronous speed, frequency of generated voltage, emf equation, with the concept of winding factor (excluding the derivation and calculation of winding factors).	
Teaching-Learning Process	Machine cut-out demo/actual models, YouTube videos, chalk, and talk.Practical Topic: Demonstration of working of Induction motor.
Module - 5	
Power transmission and distribution: Concept of power transmission and power distribution. Lowvoltage distribution system (400 V and 230 V) for domestic, commercial, and small-scale industry through block diagrams only. **Electricity bill:** Power rating of household appliances including air conditioners, PCs, laptops, printers,etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric Shock, Earthing and its types, Safety Precautions to avoid shock,and Residual Current Circuit Breaker (RCCB).	
Teaching-Learning Process	Chalk and talk, Demonstration of functioning of MCG and Fuse. Visit: Visit nearest area substation/locality pole or pad-mounted transformer.Self-study topic: Safety precautions to avoid shock.
Course outcomes: At the end of the course, the student will be able to 1) **CO1:** Analyse basic DC and AC electric circuits. 2) **CO2:** Explain the working principles of transformers and electrical machines. 3) **CO3:** Explain the concepts of electric power transmission and distribution of power. 4) **CO4:** Understand the wiring methods, electricity billing, and working principles of circuit protectivedevices and personal safety measures.	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together **Continuous Internal Evaluation:** Three Unit Tests each of **20 Marks (duration 01 hour**) 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester **3.** Third test at the end of the 15th week of the semester Two assignments each of **10 Marks** 4. First assignment at the end of 4th week of the semester 5. Second assignment at the end of 9th week of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for	

20 Marks (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. 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

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Electrical and Electronic Technology	Edward Hughes	Pearson	12th edition, 2016
2	Basic Electrical Engineering	D. C. Kulshreshtha	McGraw-Hill Education	1st edition, 2019
3	A Textbook of Electrical Technology	B.L.Theraja	S Chand and Company	Reprint Edition2014
Reference Books				
1	Basic Electrical Engineering	P.V. Prasad et al.	Cengage	2019
2	Basic Electrical Engineering	D.P. Kothari et al	McGraw-Hill Education	4th Edition,2019
3	Principles Electrical Engineering and Electronics	V.K Mehata, RohitMehta	S Chand and Company	2nd edition, 2015