Semester: I/II			
Course Title	Introduction to Electrical Engineering	**CIE Marks**	50
Course Code	BEEESC114/214	**SEE Marks**	50
Course Type	Theory	**Total Marks**	100
Course Category	ESC	**SEE Duration**	03 hrs
Hours Per Week	2L: 2T: 0P	**SEE Type**	Written
Total Hours	40	**Credits**	03

Course Learning Objectives: This course will enable the students to
• Study the generation of various electric energy and laws used in the analysis of circuits.
• Explain different types of circuits in single-phase and three phase systems.
• Explain the construction and operation of DC generators, DC motors, transformers and induction motors.
• Study of electric wiring, electricity tariff and safety measures.
Pre-Requisites
• Electrical energy, resistance, induced EMF, Faraday's laws, Fleming rules, Lenz's law, and fundamentals.

Module-1	**(8 hrs)**
Introduction: General introduction to electric energy, Conventional and non-conventional energy resources, Single line diagram of electric power systems. **Power Generation:** Conventional Energy Resources: Hydel and Nuclear, Non-conventional Energy Resources: Solar and wind power generation, (Block diagram approach). **DC Circuits:** Ohm's law and Kirchhoff's laws, analysis of series, parallel, and series-parallel circuits. Power and energy. Illustrative examples.	
Module-2	**(8 hrs)**
Single-Phase Circuits: Generation of a single-phase system. Equation of AC voltage and current, average value, RMS value, form factor, peak factor, and their relation [No derivations]. Voltage and current relationships in R, L, and C circuits, concept of power, reactive power, apparent power, and power factor, analysis of R-L, R-C, and R-L-C series circuits, parallel circuits, illustrative examples. **Three-Phase Circuits:** Generation of three-phase systems, star and delta connections, relation between phase and line values of voltages, and of currents of star and delta connections. Definition of balanced and unbalanced load. Power, reactive power, and power factor. Illustrative examples with balanced loads.	
Module-3	**(8 hrs)**
DC Generators: Principle of operation, Constructional details, and Types of generators, Relation between induced EMF and Terminal voltage, Expression for induced EMF, Illustrative examples. **DC Motors**: Principle of operation, back EMF and its significance, and types of DC motors, Torque equation, Characteristics of shunt, series, and compound motors. Applications of DC motors, Illustrative examples on shunt and series motors.	
Module-4	**(8 hrs)**
Transformers: Working principle and construction of single-phase Transformers, EMF equation, Losses, Variation of losses with respect to load, Efficiency, Illustrative examples. **Three Phase Induction Motors:** Concept of rotating magnetic field, Principle of operation, and construction and types of Induction Motor, Slip and its significance, Frequency of rotor current, Illustrative examples.	

Module-5	(8 hrs)
Domestic Wiring: Two-way and three-way control of loads. **Electricity Tariff:** Definition of "unit" used for the consumption of electrical energy, the power rating of common household appliances. Two-part electricity tariff. **Equipment Safety Measures:** Working principle of fuse and miniature circuit breaker (MCB), merits and demerits. **Personal Safety Measures**: Electric shock, safety precautions to avoid shock. Earthing and types: Plate earthing and pipe earthing.	

Text Books:	
1.	"A textbook of Electrical Technology", B. L. Theraja, Volume-1, S. Chand and Company, Reprint Edition 2014.
2.	"Principles of Electrical Engineering and Electronics", V. K. Mehta and Rohit Mehta, S. Chand and Company Publications, 2nd Edition, 2015.
Reference Books:	
1.	"Basic Electrical Engineering", D. P. Kothari and I. J. Nagrath, McGraw-Hill, 2nd edition, 3rd Reprint 2024.
2.	"Fundamentals of Electrical Engineering", Rajendra Prasad, PHI, 3rd edition, 2014.
3.	"Electrical Technology", E. Hughes, Pearson, 12th Edition, 2016.
4.	"Basic Electrical and Electronics Engineering", K. Vijayarekha, et al, Cengage. Reprint 2023.
5.	"Handbook of Electrical Engineering Formulae", Harish C. Rai, CBS Publications, 2018.

Course Outcome Statements: After the successful completion of the course, the student will be able to	
CO1	Explain the generation of power and the laws used in DC circuits.
CO2	Analyse single-phase and three-phase circuits.
CO3	Describe the construction, operation, and applications of DC machines.
CO4	Describe the construction, operation, and applications of transformers and induction motors.
CO5	Explain electricity tariff and safety measures.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	-	-	1	-	-	-	-	-	1
CO2	3	2	-	-	1	-	-	-	-	-	1
CO3	3	2	-	-	-	-	-	-	-	-	1
CO4	3	2	-	-	-	-	-	-	-	-	1
CO5	2	-	-	-	-	-	-	-	-	-	1
Avg.	**2.8**	**1.75**	**-**	-	1	-	-	-	-	-	1

3: High, 2: Medium, 1: Low

Suggested Activity Based Assessment (ABA) Methods:

Students shall select any one of the following and conduct a survey / experiment and prepare a detailed report.

- Residential Building Wiring.
- Simulation of Electric Circuits.
- Electrical Load Survey.
- Energy Conservation and Auditing.