Semester: I/II			
Course Title	Elements of Electrical Engineering	**CIE Marks**	50
Course Code	BEEESC103/203	**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 hrs	**Credits**	03

Course Learning Objectives
This course will enable the students to
● Study the laws and analysis of single-phase & three phase circuits.
● Explain the construction and working of rotating and static electric machines.
● Discuss the Uninterrupted Power Supply and Electric Vehicles.
● Study of electric safety measures and domestic wiring.
Pre-Requisites
● Electrical energy source, Resistance and Magnetic circuits

Module-1: Introduction to Electrical Engineering	**(8 hrs)**
DC circuits: Ohm's law and Kirchhoff's laws, Analysis of series, parallel and series-parallel circuits. Power and energy. **Electromagnetism:** Faraday's Laws of Electromagnetic Induction, Lenz's Law, Fleming's rules, statically & dynamically induced EMF, Concepts of self and mutual inductance, Coefficient of Coupling, Energy stored in magnetic field, Simple Numerical **Electrostatics:** Coulomb's law**,** Definitions **-**Absolute and relative permittivity, Electric field, Electric flux, Electric strength, Flux density, Capacitor: Capacitance of parallel plate, Capacitor in series & parallel, Energy stored in electrostatic field, Simple Numerical. **Self-Study Components**: Ohm's Law, Fleming's Rules, Power & Energy, Energy stored in electrostatic field	
Module-2: A C Circuits	**(8 hrs)**
Single-phase AC circuits: Generation of sinusoidal voltage, frequency of generated voltage, Expression for Average value, RMS value, form factor and peak factor of sinusoidal voltage and currents, Phasor representation of alternating quantities, Analysis of R, L & C, R-L, R-C and R-L-C circuits with phasor diagrams, Calculation of real power, reactive power, apparent power, and Power factor, Series, Parallel and Series-Parallel circuits. Simple Numerical, **Self-Study Components**: Phasor representation of alternating quantities, Real & Reactive power.	
Module-3: Three-Phase AC Circuits	**(8 hrs)**
Three-phase AC circuits: Necessity and advantage of 3-phase system, Generation of 3-phase power, Definition of phase sequence, Balanced supply and balanced load, Relationship between line and phase values of balanced star and delta connections, Power in balanced 3-phase circuits, Measurement of 3-phase power by 2-wattmeter method, Effect of power factor on wattmeter reading, Simple Numerical. **Self-Study Components**: Phase sequence	

Module-4: Introduction to UPS & Electric Vehicles	(8 hrs)
Uninterrupted Power Supply: Introduction to Uninterruptible Power Supply, Main Components of a UPS System, Types of Uninterruptible Power Supply, Comparison of Different Types of Uninterrupted Power Supply. **Electric Vehicle:** Definition and Basics, Key Components of an Electric Vehicle, Advantages of Electric Vehicles, How Electric Vehicles Work, Key Features of Electric Vehicles, Challenges and Opportunities in the Electric Vehicle Market. **Self-Study Components**: Comparison of UPS, Challenges and Opportunities in the Electric Vehicle Market.	
Module-5: Domestic Wiring and Electric Safety Measures	**(8 hrs)**
Domestic Wiring: Requirements, Types of wiring: casing & capping, Two- and three-way control of load. **Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits, Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB). **Personal safety measures:** Electric Shock, Earthing and its types, Safety Precautions to avoid shock.	

Text Books:	
1.	"Basic Electrical Engineering" by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2.	"Basic Electrical Engineering", D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, 4th edition, 2019.
3.	"Principles of Electrical Engineering & Electronics" by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
Reference Books/ e-Resources :	
1.	"Electrical Technology" by E. Hughes, Pearson, 12th Edition, 2016.
2.	"A textbook of Electrical Technology", Vol-1 by B.L. Theraja, S Chand & Company, reprint edition 2014
3.	"Fundamentals of Electrical Engineering" by Rajendra Prasad, PHI, 3rd Edition, 2014.
4.	"Electrical Technology" by E. Hughes, Pearson, 12th Edition, 2016.
5.	Hands on training on residential wiring and Safety devices www.nptel.ac.in
6.	https://datamyte.com/blog/introduction-to-electric-vehicle/
7.	https://www.javatpoint.com/ups-uninterruptible-power-supply

Course Outcome Statements: After the successful completion of the course, the student will be able to	
CO1	Explain the concept of electric circuits, electrostatic and electromagnetism.
CO2	Explain the working and operation of electric vehicles & UPS.
CO3	Apply the basic laws to solve the electric circuits.
CO4	Analyze equipment safety & personal safety measures and domestic wiring.
CO5	Prepare a report on electrical energy conservation & auditing and details of batteries.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	1
CO2	1	-	-	-	-	-	-	-	-	-	-	1
CO3	-	2	-	-	-	-	-	-	-	-	-	1
CO4	-	-	1	-	-	-	-	1	-	-	-	-
Avg.		-	-	1	1	1	1	1	2	1	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 the detailed report.

- Creating Awareness of Electrical Energy Conservation among the Public.
- Battery Technology.
- Simulation of Electric Circuits.
- Hybrid Electric Vehicles.