



Semester:	I/II	Course Type:	IESC		
Course Title: Elements of Electrical Engineering					
Course Code:	25EEI14/24		Credits:		04
Teaching Hours/Week (L:T:P:S)			3:0:2:1	Total Hours:	40(Theory)+ 12(Lab Slots)
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	03
I. Course Objectives: At the end of the course student will be able to					
<ul style="list-style-type: none">• Explain insights of energy sources and general structure of power system.• Study & analyse fundamentals of DC &AC circuits.• Understand the construction, working principle and applications of electrical machines.• Study the domestic wiring, tariff and electrical safety practices• Explore fundamentals of UPS and its applications.					
II. Teaching-Learning Process (General Instructions):					
<ul style="list-style-type: none">• Chalk and talk method/Smart interactive panel• Power point presentation/ Keynotes• Videos• Animations• Self-learning• Demo models					
III. COURSE CONTENT					
III(a). Theory PART					
Module-1: DC Circuits & AC Fundamentals					8 Hours
DC circuits: Introduction to DC circuits, ohms law, Kirchhoff's laws, concept of power and energy. Analysis of series parallel circuits and numerical.					
AC fundamentals: Generation of sinusoidal voltage, concept of phasors, time period, frequency, instantaneous values, peak, average, RMS value, peak factor, and form factor, Simple Numerical.					
Textbook: Chapter: Sections: Basic Electrical Engineering, D C Kulshreshtha: Chapter 2, Section-2.1,2.2, Chapter-3, Section-3.6, 3.7,3.8, Chapter-9, Section- 9.1,9.2,9.3					
Pre-requisites: Faraday's Laws of Electromagnetic Induction					
RBT Levels: L1,L2,L3					
Module-2:Single phase & Three phase AC circuits					8 Hours
Single-phase AC Circuits: Analysis of R, L, C circuits with phasor diagrams, series RL, RC and numerical.					
Three phase AC Circuits: Generation of three phase AC quantities, advantages and limitations. star and delta connections, relationship between line and phase quantities. Measurement of 3-phase power by 2-wattmeter method. numerical					

Textbook: Chapter: Sections: Basic Electrical Engineering, D C Kulshreshtha: Chapter-9, Section-9.7, Chapter 10, Section – 10.1 to 10.2, Chapter 12, Section- 12.3 to 12.9, 12.11	
Pre-requisites: Acquaintance of circuit parameters R, L and C	
RBT Levels: L1,L2,L3	
Module-3:Three phase induction motors and DC motor	8 Hours
Three phase induction motors: Construction of 3-phase induction motor, concept of rotating magnetic field. Working principle, types, Slip and its significance, applications, numerical. DC Motor: Construction & working principle of operation, back emf and its significance. Torque equation types & characteristics of DC motors (Series and shunt only), applications. numerical.	
Textbook: Chapter: Sections: Basic electrical engineering, D C Kulshreshtha: Chapter 15, Section- 15.1 to 15.4, 15.7, Chapter-16: Section-16.2, 16.12, 16.13	
Pre-requisites: Mutual Induction principle, Fleming's rule	
RBT Levels: L1,L2,L3	
Module-4:Single-phase Transformers& UPS Basics	8 Hours
Single-phase Transformers: Construction and types, operating principle, EMF equations, losses, and efficiency, numerical UPS Basics: Introduction, types of UPS, applications, Basics of Batteries, types and it's parameters, applications of batteries. UPS and battery calculations	
Textbook: Chapter: sections: 1. Basic electrical engineering, D C Kulshreshtha, Chapter-13, Section-13.1,13.2,13.5,13.10 2. Uninterrupted power supply system, Kamal Maity: Chapter 1: section 1.1, Chapter 4: 4.1 to4.5 Chapter 5: section 5.3.7, Chapter 6: section 6.6	
Pre-requisites: Mutual Induction principle, Fleming's rule, Electrolysis	
RBT Levels: L1,L2,L3	
Module-5:Energy Resources & Domestic Wiring	8 Hours
Energy Resources: Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach. Domestic Wiring: Introduction, Service mains, meter board and distribution board. Types of domestic wiring (Casing-Capping and Conduit)Two way and three-way control of load. Definition of electrical unit, two-part electricity tariff, calculation of electricity bill for domestic consumers. Safety measure-Working principle of fuse and miniature circuit breaker (MCB), merits and demerits of fuse and MCB, Earthing and its types (Pipe & Plate Earthing only).	
Textbook: Chapter: sections: 1. A Course in Power Systems, J B Gupta: Part-1, Chapter-1, section-1.3, Chapter-7, section 7.1, Part-2, Chapter-1, section-1.6 2. Basic Electrical Engineering, D C Kulshreshtha: Chapter 19: Section 19.2, 19.3,19.4,19.6,19.7,19.9.	
Pre- Pre-requisites: Fundamentals of AC supply.	
RBT Levels: L1,L2,L3	
III(b). PRACTICAL PART	
Sl. No.	Conventional Experiments
1	Verification of KCL and KVL for DC circuits
2	Measurement of current, power and power factor of incandescent lamp, fluorescent lamp and LED lamp.
3	Measurement of resistance and inductance of a choke coil using three voltmeter method.

4	Determination of phase and line quantities in three phase star connected loads.														
5	Determination of phase and line quantities in three phase delta connected loads.														
6	Two way and three-way control of lamp and formation of truth table.														
7	Study of effect of open and short circuit for a simple AC circuit.														
Open-Ended Experiments															
8	Demonstration of fuse and MCB separately by creating a fault.														
9	Demonstration of Cut-out section of electrical machines (DC machines, Induction machines and synchronous machines)														
10	Understanding of UPS														
IV. COURSE OUTCOMES															
At the end of the course students will be able to															
CO1	Apply and demonstrate the basic electrical laws to solve DC and AC circuits.														
CO2	Explain and visualize the construction, types and working of electrical machines.														
CO3	Demonstrate and Illustrate concepts of domestic wiring, safety measures.														
CO4	Discuss the various energy sources, basic concepts of UPS with visualization.														
V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)															
PO/P SO	1	2	3	4	5	6	7	8	9	10	11	S1	S2	S3	S4
CO1	3	1							1			2			
CO2	3	1										2	2		
CO3	3					2			1			2			
CO4	3					2						2			
VI. Assessment Details (CIE & SEE)															
General Rules: Refer Annexure section 2															
Continuous Internal Evaluation (CIE): Refer Annexure section 2															
Semester End Examination (SEE): Refer Annexure section 2															
VII. Learning Resources															
VII(a): Textbooks:															
Sl. No.	Title of the Book		Name of the author			Edition and Year			Name of the publisher						
1	Basic electrical engineering		D C Kulshreshtha			Revised 1 st edition			Tata McGraw Hill.						
2	A Course in Power Systems		J B Gupta			11 th Edition, Reprint 2021			S.K. Kataria & Sons						
3	Uninterrupted power supply system		Kamal Maity			1 st Edition, 2017			Independently Published						
VII(b): Reference Books:															
1	A Textbook of electrical technology		B.L.Theraja			Reprint edition 2014			S Chand and Company						

VII(c): Web links and Video Lectures (e-Resources):
https://archive.org/details/NPTEL-ElecEngr-Basic_Electrical_Technology https://www.youtube.com/playlist?list=PLkeOqogma9vhAYH2Oyyesp5HmHovYGPol https://www.youtube.com/@eeddepartment4878 https://www.youtube.com/watch?v=6p5WXzrYYiI https://www.youtube.com/watch?v=0wkjISZt0ko
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
Seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, Field visits etc.