BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING
(Approved by AICTE, New Delhi & Affiliated to Guru Gobind Singh Indraprastha University, Delhi)
(An ISO 9001:2015 Certified Institution)
A-4, Paschim Vihar, Main Rohtak Road, New Delhi – 110 063

Department of Electrical & Electronics Engineering

3.1.1 Course Name: Utilization of Electrical Energy Course Code: (EEE 320T)

At the end of the course, student will be able to

CO	Statement	Bloom Level(s)
EEE 320T.1	**Explain** the basics of Illumination and the working of different types of lamps	2
EEE 320T.2	**Apply** heating/ welding scheme for a specific work piece	3
EEE 320T.3	**Analyze** AC and DC traction systems and characteristics of traction motors	4
EEE 320T.4	**Select** a suitable energy storage devices for a given application	5

3.1.2. CO-PO matrices

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	--	--	--	--	--	--	--	--	--	--	3	2
CO2	3	3	--	2	--	--	2	--	--	--	--	--	3	2
CO3	3	3	--	2	--	--	2	--	--	--	--	--	3	2
CO4	3	3	3	--	--	--	--	--	--	--	--	--	3	2

Note: Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM/HIGH	Justification
CO_1-PO_1	High	Knowledge of mathematics and engineering fundamentals is required to understand and calculate various parameters of Illumination
CO_1-PO_2	High	Problem Analysis is needed to compute the illumination values corresponding to a lighting scheme
CO_2-PO_1	High	Knowledge of science and engineering fundamentals are required to understand the operation of different heating/ welding schemes to select an appropriate scheme for the given application

CO_2-PO_2	High	First principles of mathematics and engineering sciences are required to identify, compare and analyze advantages and disadvantages of different heating/ welding schemes
CO_2-PO_4	Medium	Research-based knowledge can be used to analyze and interpret data in order to select appropriate heating/ welding schemes required for the given application
CO_2-PO_7	Medium	Selection of heating/ welding scheme for an application is based on its environmental impact
CO_3-PO_1	High	Sound knowledge of mathematics, science and engineering fundamentals is required to understand and compare AC & DC tractions systems. It'll also be useful to analyze the different types of characteristics of the various traction motors to select an appropriate traction system for a given application
CO_3-PO_2	High	To select an appropriate traction system for a given application, it will be also be useful to analyze the different types of characteristics of the various traction motors
CO_3-PO_4	Medium	Through analysis of various characteristics and interpretation of data, different speed control methods and traction schemes can be compared.
CO_3-PO_7	Medium	Ability to assess and understand the societal, health and safety issues associated with different facets of Electric utilization and traction is required.
CO_4-PO_1	High	Knowledge of science and engineering fundamentals is required to understand the constructional details and principle of operation of different energy storage devices
CO_4-PO_2	High	First principles of mathematics and engineering sciences are required to identify, compare and analyze characteristics, advantages and disadvantages of different energy storage devices
CO_4-PO_3	High	Battery Management Systems need to be designed so as to cater to a particular load.
CO_1 to CO_4-PSO_1	High	Knowledge of Electric energy utilization and Electric traction will help in understanding electrical and electronics engineering concepts, analyzing & interpreting given data, and designing & implementing solutions to meet the specific requirements
CO_1 to CO_4-PSO_2	Medium	Understanding the concepts of electric energy utilization and electric traction will enable design, encourage analysis and enhance problem-solving skills for solving real-world problems

Lesson Plan

(Utilization of Electrical Energy)

Paper Code: EEE 320T	**L**	**T**	**C**
Paper: Utilization of Electrical Energy	**3**	**0**	**3**

Topics to be covered		
S. No.	**Contents**	**Total Lectures +Tutorials**
	UNIT-I	
1.	Introduction, terms used in illumination	1
2.	Laws of illumination	1
3.	Polar curves, photometry, integrating sphere	1
4.	Sources of light, discharge lamps, Mercury Vapour and Sodium Vapour lamps- their characteristic and applications	1
5.	Performance comparison between tungsten filament lamps, fluorescent tubes, CFL and LED Lights	1
6.	Basic principles of light control	1
7.	Types and design of lighting schemes and flood lighting	1
	UNIT-II	
8.	Principle and application of resistance, induction and dielectric heating	1
9.	Infrared or radiant heating	1
10.	High frequency eddy current heating, arc furnaces, induction furnace, electric supply for high frequency heating applications	1
11.	Resistance welding; arc welding	1
12.	Welding generator and welding transformer	1
13.	Properties of arcing electrode, comparison between resistance and arc welding	1
14.	Comparison between A.C. and D.C welding	1
	UNIT-III	
15.	Advantages of electric traction, requirements of an ideal traction system	1
16.	Different system of electric traction	1
17.	Comparison between D.C. and A.C. systems of railway electrification; speed – time curves	1
18.	Different types of traction motors and their characteristics	1
19.	Parallel operation of traction motors	1
20.	Starting and speed control of 3 phase induction motors, braking	1
21.	Advantages and disadvantages of regenerative braking. Calculation of energy returned during regeneration	1
	UNIT-IV	
22.	Principles and applications of electrolysis	1
23.	Faraday‘s law of electrolysis, electroplating	1
24.	Calculation of current required for depositing given amount of metal, current efficiency, voltage-energy efficiency, extraction of metals	1
25.	Electrodeposition, factors governing electrodeposition process	1
26.	Constructional details, principle of operation of Rechargeable Alkaline, Nickel – Cadmium, Nickel-Metal Hydride, Lithium ion and Lead-acid batteries, their comparison and applications	1
27.	Charging of batteries and rating	1
28.	Fuel cell and use of electric double layer capacitor (super capacitor) as battery bank	1

Teaching Pedagogy

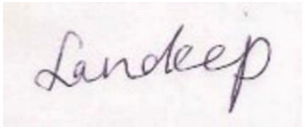
Constructivist and Collaborative pedagogy is used in the theory and Integrative pedagogy is invoked for the practicals.

The conceptual portion is elucidated using chalk and talk. The routine lectures are supplemented by presentations and videos. State of the art experiments are earmarked as content beyond the syllabus for the laboratories. Additional marks are awarded to scholars who propose feasible innovative ideas and/ or solutions.

The salient aspects of the pedagogy are as follows:

- The course instructors work together with students to design activities and exercises for learning
- The course instructors allocate appropriate time to develop learning designs so the 'joint productive activity' is accomplished
- The course instructors arrange the learning environment to allow students to communicate effectively with each other
- The course instructors involve themselves in the key learning concepts the students are going through
- The course instructors mix students up in activities and exercises so they can get ideas from different cultures, backgrounds, abilities and viewpoints
- The course instructors mix the activities, so students enjoy individual work, pairs, small groups and whole group learning tasks
- The course instructors build confidence in the students and delegates by positive interactions and the development of interactive exercises

The students are encouraged to immerse themselves in project based learning. A keen focus is also maintained on the overall percentage of student attendance.



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