Course Name Utilization of Electric Power

Course Code EE702A

Course Credit 3

Contact Hour 3P

Prerequisite Basic Electrical Engineering, Electrical Machines, Power System

Course Objective

The objectives of this course are

1. To prepare students to analysis of any traction system.
2. To teach principles of Electric traction motor & their control and how they work.
3. To empower students to understand the working of Electric Heating, welding processes**.**
4. To expose the students to the concepts of various types of illumination and applications of illumination.
5. To analyze power requirements, power capability, efficiency, operating characteristics, control requirements and electrical demands of these systems.

Course Outcome

On completion of the course students will be able to

1. Formulate and then analyze the working of traction motor & their control using mathematical model under loaded and unloaded conditions.
2. Understand and explain the principle of operation and performance of traction motor.
3. Analyze the response of d.c. motor, induction motor and transformer.
4. Troubleshoot the operation of d.c. motor, induction motor and transformer.
5. Analyze the working of Electric Heating, welding processes.
6. Calculate illumination level for a given application and then select the suitable specification for installation.

CO Mapping with departmental POs

H: High, M: Medium, L: Low

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	H											
CO 2	H	M	L									
CO 3			M	H								
CO 4			M	H								
CO 5			H									
CO 6			M	H								

Course Content

Module 1: Electric Traction **16L**

Requirement of an ideal traction system, Supply system for electric traction, Train movement (speed time curve, simplified speed time curve, average speed and schedule speed), Mechanism of train movement (energy consumption, tractive effort during acceleration, tractive effort on a gradient, tractive effort for resistance, power & energy output for the driving axles, factors affecting specific energy consumption, coefficient of adhesion).

Electric traction motor & their control:

Parallel and series operation of Series and Shunt motor with equal and unequal wheeldiameter, effect of sudden change of in supply voltage, Temporary interruption of supply, Tractive effort and horse power. Use of AC series motor and Induction motor for traction.

Traction motor control:

DC series motor control, Multiple unit control, Braking of electric motors, Electrolysis by current through earth, current collection in traction system, Power electronic controllers in traction system.

Module 2: Illumination **8L**

The nature of radiation, Polar curve, Law of illumination, Photometry (Photovoltaic cell, distribution photometry, integrating sphere, brightness measurement)

Types of Lamps:

Conventional and energy efficient, Basic principle of light control, Different lighting scheme & their design methods, Flood and Street lighting.

Module 3: Electric Heating welding **8L**

Types of heating, Resistance heating, Induction heating, Arc furnace, Dielectric heating, Microwave heating.

Module 4: Electrolytic processes **8L**

Basic principles, Faraday's law of Electrolysis, Electro deposition, Extraction and refining of metals, Power supply of Electrolytic processes.

Numerical problems to be solved in the tutorial classes.

Text Books

1. Generation Distribution and Utilization of Electrical Energy, C.L. Wadhawa, New Age International Publishers.
2. Art and Science of Utilization of Electrical Energy, H. Partab, Dhanpat Rai & Sons.
3. Utilisation of Electric Energy, E.Openahaw Taylor, Orient Longman.