**4.5 UTILIZATION OF ELECTRICAL ENERGY**

**L P**

**3 -**

**RATIONALE**

**This subject assumes importance in view of the fact that an electrical technician has to work in a**

**wide spectrum of activities wherein he has to make selection from alternative schemes making**

**technical and economical considerations; e.g. to plan and design an electrical layout using basic**

**principles and handbooks, to select equipment, processes and components in different situations.**

**The contents have been designed keeping the above objectives in view. Besides giving him basic**

**knowledge in the topics concerned, attempts have been made to ensure that the knowledge**

**acquired is applied in various fields as per his job requirements. To orient the subject matter in**

**the proper direction, visits to industrial establishments are recommended in order to familiarize**

**the students with the new developments in different areas**

**COURSE OUTCOMES**

**After undergoing the subject, the student will be able to:**

**CO1: Design the level of illumination based on applications**

**CO2: Identify most appropriate heating and welding techniques for suitable applications.**

**CO3: Illustrate the fundamentals on electrolytic and electrometallurgical processes.**

**CO4: Detail electrolytic principle for various applications**

**CO5: Apply principle of electric traction system & speed– time curves of different traction**

**Systems.**

**DETAILED CONTENTS**

**UNIT I**

**Illumination**

**Introduction, terms used in illumination, laws of illumination, indoor and outdoor illumination**

**levels. Discharge lamps, MV and SV lamps. General ideas about time switches, street lighting,**

**flood lighting and decorative lighting.**

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**UNIT II**

**Electric Heating & Electric Welding**

**Advantages and methods of electric heating, resistance heating, induction heating, and dielectric**

**heating. Electric welding, resistance and arc welding, electric welding equipment, comparison**

**between A.C. and D.C, Welding.**

**UNIT III**

**Electrolytic Processes**

**Need of electro-deposition; Laws of electrolysis; process of electro-deposition - clearing,**

**operation, deposition of metals, polishing and buffing; Principle of galvanizing and its**

**applications; Principles of anodizing and its applications; Electroplating of non-conducting**

**materials, Electrical Circuits used in Refrigeration and Air Conditioning and Water Coolers.**

**UNIT IV**

**Electric Drives**

**Electric Drive and its part, Advantages of electric drives, Types of electric Drives,**

**Characteristics of different mechanical loads, Types of motors used in used in Industrial Drives,**

**Factors affecting selection of motors, Applications of Electric Drive. Introduction to Energy**

**efficient drives.**

**UNIT V**

**Electrical Traction**

**Advantages of electric traction, Concept of diesel electric Traction system, Systems of Track**

**Electrification (DC & AC system), types of services – urban, sub-urban, and main line and their**

**speed-time curves. Electrical block diagram and accessories of an electric locomotive and**

**different accessories for track electrification such as overhead centenary wire, conductor rail**

**system, current collector / pentagraph etc. Power supply arrangements and types of motors used**

**for electric traction. Starting and braking of electric locomotives. Introduction to EMU and**

**metro railways**

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**SUGGESTED WEBSITES**

**1. http://swayam.gov.in**

**2. https://nptel.ac.in/**

**RECOMMENDED BOOKS**

**1. H Partap, “Art and Science of Utilization of Electrical Energy”,Dhanpat Rai &Sons,**

**Delhi**

**2. JB Gupta, “Utilization of Electrical Energy”, Kataria Publications, Ludhiana**

**3. Sahdev, “Utilization of Electrical Energy”, Uneek Publication, Jalandhar**

**4. Dr. SL Uppal, “A Text Book. of Electrical Power” Khanna Publications, Delhi**

**5. H Partap, “Modern Electric Traction”, Dhanpat Rai & Sons, Delhi**

**6. OS Taylor, “Utilization of Electrical Energy” Pitman Publications**

**7. CL Wadhwa, “Generation, Distribution and Utilization if Electrical Power” Wiley**

**Eastern Ltd., New Delhi**

**INSTRUCTIONAL STRATEGY**

**It is desired to give ample practical examples in the class while teaching this subject. Teacher**

**must supplement his/her classroom teaching with aids such as models, charts, and video films**

**from time to time. This subject requires demonstrations and exposure to actual**

**workplace/industry/field. For this purpose, the subject teacher should do advance planning for**

**visits/studies related to each topic in consultation with HOD and Principal of the**

**polytechnic/institution. Students should be taken for visits to nearest electrified railway track**

**and railway station to study the electric traction system. This subject contains four units of**

**equal weight age.**

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