

3/4 B.Tech. FIRST SEMESTER

EE5T3

UTILIZATION OF ELECTRICAL ENERGY

Credits: 3

Lecture: 3 periods/week

Tutorial: 1 period /week

Internal assessment: 30 marks

Semester end examination: 70 marks

Objectives:

This subject deals with the fundamentals of illumination and its classification and the electric heating and welding. It gives the detailed study of all varieties of Electric drives and their application to electric traction system.

Learning Outcomes:

1. Able to maintain electric drives used in an industries
2. Able to identify a heating/ welding scheme for a given application
3. Able to maintain/ Trouble shoot various lamps and fittings in use
4. Able to figure-out the different schemes of traction schemes and its main components
5. Able to design a suitable scheme of speed control for the traction systems

Unit I Electric Drives

Type of electric drive, choice of motor, starting and running characteristics, speed control, selecting motor power rating for continuous, intermittent and short time rating duty, heating and cooling of motors, temperature rise, particular applications of electric drives, type of industrial loads, load equalization ,flywheel and its applications.

Unit II Electric Heating & Electric Welding

Advantages and methods of electric heating, methods of heat transfer, Stefan's law, resistance heating, design of heating elements, losses and efficiency, construction and working principle of induction furnaces, arc furnaces and dielectric heating and control equipment.

Type of welding, resistance and arc welding, comparison between A.C and D.C Welding.

Unit III Illumination Fundamentals & Methods

Introduction, Terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light.

Incandescent lamps, Discharge lamps, MV and SV lamps, fluorescent lamps-CFL - LED lamps, Induction lamps ,effect of voltage variation on lamp efficiency ,lamp ratings and efficiency

Basic principles of light control, Type and design of lighting schemes, factory lighting, flood lighting and street lighting, calculations.

Unit IV Electric Traction-I

System of electric traction and traction electrification, Diesel electric traction systems in India, Special features of traction motors, methods of electric braking-plugging, rheostatic braking and regenerative braking, Speed-time curves for different services- trapezoidal and quadrilateral speed time curves. Introduction to Hybrid vehicles.

Unit V Electric Traction- II

Mechanics of train movement ,Calculations of tractive efforts and power output of traction motor, Specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation and coefficient of adhesion.OHE in traction system, collectors and modern electric locomotive.

Learning resources

Text books:

1. Utilization of Electrical Energy - by E. Openshaw Taylor, Orient Longman
2. Art & Science of Utilization of Electrical Energy - by Partab, Dhanpat Rai & Sons

Reference books:

1. Utilization of Electrical Power including Electric drives and Electric traction – by J.B. Gupta, S.K. Kataria & Sons, .
2. Generation, Distribution and Utilization of Electrical Energy – by C.L. Wadhwa New Age international (P) Limited, Publishers, 1997