

COURSE TITLE : **ELECTRIAL POWER UTILISATION**
COURSE CODE : **4043**
COURSE CATEGORY : **A**
PERIODS/WEEK : **4**
PERIODS/SEMESTER : **72**
CREDITS : **4**

TIME SCHEDULE

MODULE	TOPIC	PERIODS
I	Electric Heating & Welding	17
	Test I	1
II	Electrolysis & Electrical drive in industry	17
	Test II	1
III	Traction & speed time curve	17
	Test III	1
IV	Electric traction characteristics	17
	Test IV	1
	Total	72

Rationale

The electrical energy utilisation includes heating, welding, drives & traction etc. The development of industries depends upon the energy utilisation in different field. The increased efficiency of the devices used in the system are very important. This subject helps the students to analyse the devices used and the nature energy conversion in industry or traction. The knowledge gained in this subject is help full to the students in future as well as in job opportunities

OBJECTIVES

Upon completion of course, student should be able to:

MODULE – I

1.1.0. Electric heating & welding

- 1.1.1. State Modes of heat transfer
- 1.1.2. List the advantages of electric heating
- 1.1.3. List the requirements of good heating material
- 1.1.4. Explain with sketches: a) Direct resistance heating b) Indirect resistance heating
- 1.1.5. State the Industrial application of the direct & indirect resistance heating
- 1.1.6. Explain Direct Arc furnace & indirect arc furnace with diagram
- 1.1.7. Explain the principle of operations of following induction furnaces with sketches
 - a) Low and high frequency,
 - b) Core type and core less types
- 1.1.8. Explain the principle of dielectric heating
- 1.1.9. List the industrial applications of the dielectric heating
- 1.1.10. State the different types of Electric Welding
- 1.1.11. Explain the principles and applications of a) Spot b) Seam c) butt welding
- 1.1.13. Explain the characteristics of a welding generator
- 1.1.14. Explain with sketch the principle of operation of welding transformer used with a reactance coil

MODULE - II

2.1.0. Electrolysis & Electrical Drives in Industry

- 2.1.1. Know the process of electrolysis
- 2.1.2. Understand the Faraday's laws of electrolysis
- 2.1.3. Know the field of applications of electrolysis
- 2.1.4. State the advantage of Electric drives
- 2.1.5. List the factors governing the selection of motors
- 2.1.6. Classify the electric drives
- 2.1.7. State the advantages and disadvantages of group drive
- 2.1.8. State the advantages and disadvantages of individual drive
- 2.1.9. Select the suitable motors for the following industries
(i) Steel mills ii) paper mills iii) cement industries

MODULE-III

4.1.0. Traction & speed-time curves

- 4.1.1. Know different Systems of traction
- 4.1.2. State the advantages of electric traction
- 4.1.3. State the importance of the speed time curves
- 4.1.4. State the each stage of the speed time curve with appropriate speeds used
- 4.1.5. Sketch the simplified speed time curves and derive the relation
- 4.1.6. Explain the practical importance of the above curves
- 4.1.7. Solve the simple problems using speed time curves
- 4.1.8. Explain the meaning of traction effort
- 4.1.9. Explain the term specific energy consumption
- 4.1.10. Derive the formula for energy output of drive axles in
 - i) Accelerations
 - ii) To overcome friction
 - iii) To overcome gradient
- 4.1.11. List the factors affecting specific energy consumption

MODULE – IV

5.1.0. Electric Traction characteristics

- 5.1.1. State the important requirements of traction motor
- 5.1.2. Explain the suitability of following motors for electric traction
 - a) D C series motor
 - b) A C series motor
- 5.1.3. State the advantages of electric braking
- 5.1.4. Explain the following methods of electric braking
 - a) Plugging
 - b) Regenerative
 - c) Rheostatic
- 5.1.5. State the method of regenerative braking of D.C shunt motor, D.C series motor and 3-phase induction motor
- 5.1.6. Explain the method of Rheostatic braking d.c shunt motor and series motor

COURSE CONTENT

MODULE – I

Electric Heating

Electrical heating and welding – advantages and types of electric heating - properties of resistance heating-materials. Resistance ovens- Induction heating - principle – factors affecting induction heating- induction furnace- core type and core less type - high frequency eddy current heating-

dielectric heating - equivalent circuit – loss angle application of dielectric heating - Arc furnace – direct and indirect types – equivalent circuit.-

Electric Welding

Electric welding – types – resistance welding-spot welding- pre welding, seam welding and butt-welding – Types of arc welding – requirements of welding generators and transformers - Use of reactor for control of welding current - Third brush and Bipolar welding generator

MODULE – II

Electrolysis & Electrical Drives in Industry

Electrolysis – Faraday’s laws of Electro types – applications – Mechanical features of electronic motor – types of enclosures . Electric drives –classification of electric drives - group, individual and multi motor drives - Selection of electric drives – steel mills, paper mills, cement mills

MODULE- III

Electric Traction and speed-time characteristics

Electric traction - system of electric traction - Direct electric traction - diesel electric traction - Merits and demerits. Speed time curves for train movement – Simplified speed time curves - specific energy output on level track - factors affecting specific energy consumption - Simple problems.

MODULE-IV

Traction motors &Electrical braking

Traction motors - D.C. and A.C. motors – properties and characteristics - control of DC motors – Series-parallel control systems of electric traction - D.C. single and single phase systems of supply – brief description. Electric braking of traction motors – plugging - regenerative braking - Rheostat braking –

REFERENCE BOOKS

1. Principles of Power System – V.K. Mehta
2. Utilisation of Electrical Energy- N.V.Surya Narayana
3. Utilisation of electrical power – J B Guptha