

COURSE NAME : Electrical Engineering Group

COURSE CODE : EE/EP

SEMESTER : Fifth

SUBJECT TITLE : Industry Electrical Systems-II

SUBJECT CODE :

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
04	--	--	03	100	--	--	--	100

- External

@ - Internal

NOTES:

- 1. Two tests each of 25 marks to be conducted as per the schedule given by the MSBTE**
- 2. Total of test marks for all the theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW)**

Rationale:

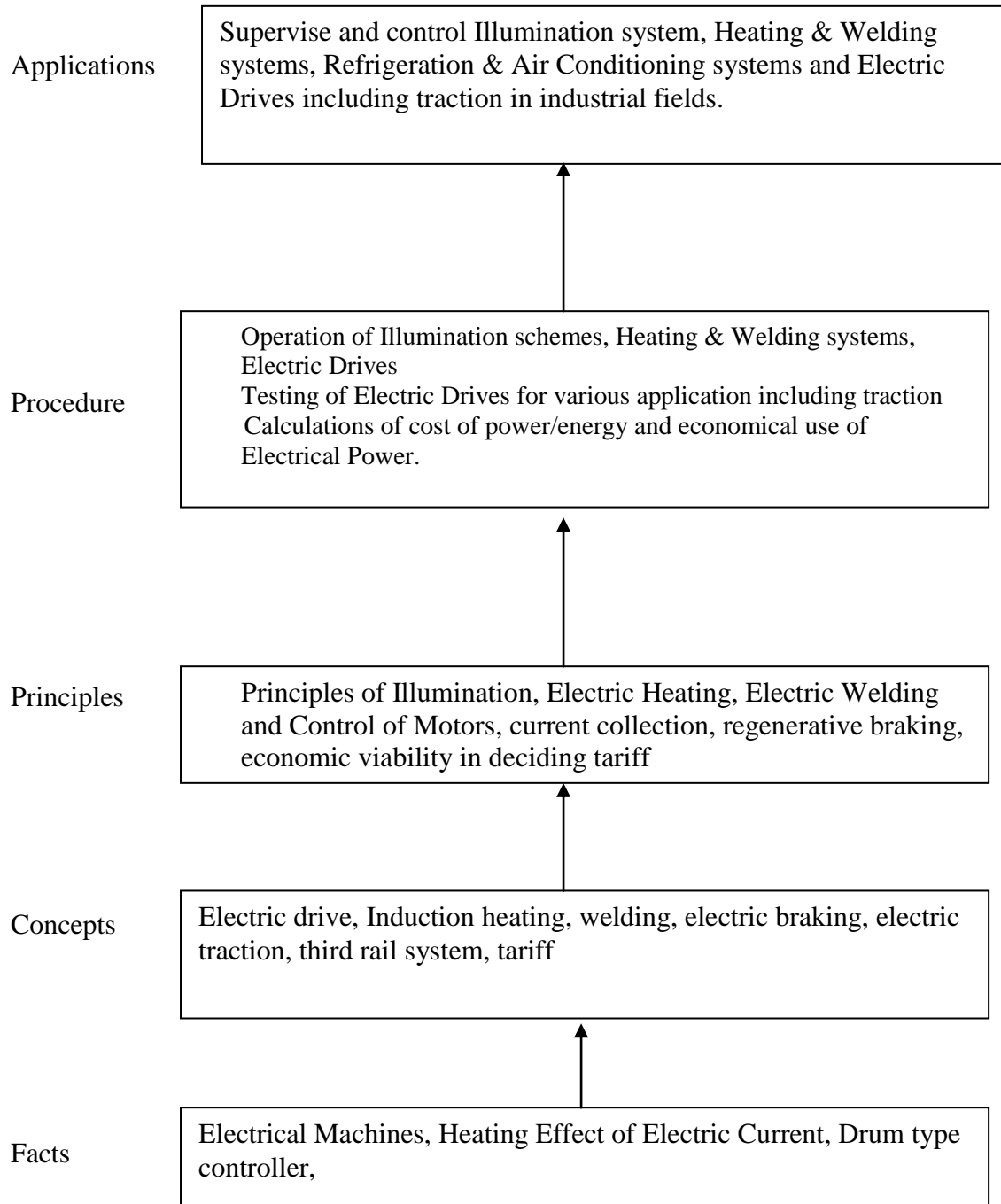
The main Job functions of a electrical diploma holder are to supervise the operation & control of various electrical drives, electrical furnaces, electrical welding equipments. The factory illumination scheme is also to be maintained by them. Therefore the knowledge of operation & control of these machines & equipments is required for every diploma engineer, Railway is the one of major employer of electrical diploma engineer; therefore it is essential for a diploma holder to acquire the knowledge of electric traction.

Due to power crises, economical utilization of electrical energy and energy conservation is an essential aspect. Hence it is essential for every diploma engineer to study the utilization of electrical energy.

General Objectives:

1. Select drive for specific application.
2. Compare different methods of electric heating & welding.
3. Explain the importance of good illumination
4. Explain the various components in electric traction system.
5. Get the knowledge of electrical energy conservation.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
<p>Topic 1: Electric Drives & Elevators</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Selection of particular drive for a particular application <p>Contents:</p> <ul style="list-style-type: none"> • Concept of drive and its Advantages & Disadvantages • Factors Governing Selection of Electric Drives (Motor) • Nature of Drives :- Group, Individual & Multi motor Drives, their Advantages , Disadvantages and Applications • Mechanical Features of drives: <ul style="list-style-type: none"> ➤ Purpose, Types & Application of various types of Enclosure, ➤ Function of Bearing, Types of Bearing (Ball & Sleeve Bearing) Advantages & Disadvantages, Applications, • Transmission of Mechanical Power: • Direct drive and its applications • Indirect Drives: Belt, Rope, Chain, Gear& Vertical drives and their Applications, • Noise : Reasons for production of noise & Methods of Noise reduction • Size & Rating of Motor : Definition of Standard Rating as per ISS -- ---- a) Continuous Rating b) Continuous maximum Rating c) Short time Rating, • Load Cycles : Continuous loading, Short time loading, Long time (Intermittent) Loading, Continuous operations short time loading, Continuous operations long time loading: Concept with graphical representation • Expression of Rating of motor [No Derivation] Simple Numerical on estimating Size (Rating) of Continuously Rated Motor. • Load Equalization : Meaning of load equalization, Method of load equalization, Condition of load equalization • Braking : Definition of Braking, Requirements of Ideal Braking System, Advantages & Disadvantages of Electrical Braking over Mechanical Braking System. <ul style="list-style-type: none"> ▪ Types of electrical braking systems: plugging, Rheostatic (Dynamic) & Regenerative braking for D.C Series Motor, 3 - Phase Induction Motor, ▪ Condition to achieve Regenerative Braking. • Elevators: Function, Application of Elevator, Ideal Requirements of Elevators, Meaning of Car & Pent house, Factors on which Shape & Size of Car depends, unit of Speed of Elevators, Factors affecting Speed of Elevators. 	10	20
<p>Topics 2: Electric Heating</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Select method of Electric Heating as per requirement of the 	10	16

application

- Decide the rating of the equipment

Contents:

- Concept of electrical heating, Classification of Electric Heating Advantages & disadvantages , Modes of Heat transfer with definitions,
- Resistance Heating:- Properties of material used as a heating element, Causes of failure of heating element, Design of heating element (Circular & Rectangular Strip), **Simple Numericals**, Methods of temperature control (By varying voltage across heating element, By varying the value of Resistance of Heating element, By use of Thermostat),
- Direct & Indirect resistance heating: Meaning of the terms, Working principle, constructional features and applications
- Arc Heating: - Principle of Arc Heating, Properties of material used for electrode, advantages of graphite electrode over carbon electrode,.
- Direct Arc Furnace: - Constructional features and operation of arc Furnace, Specifications of arc furnace: Temperature obtain, Power Factor, Size (capacity) of furnace, Average Power required, Average Energy consumption required, and Its Applications.
- Indirect Arc Furnace :- Constructional features and operation, Specifications: Temperature obtain, Power Factor, Average Power required, Average Energy consumption, Its Applications, Advantages & Disadvantages
- Temperature Control : Voltage Control method & Electrode-positioning control with figure
- List of Equipments used in arc furnace & their application.
- Induction Heating :- Working Principle, Constructional features, Principle of operation, Advantages & Disadvantages & Applications of Direct Induction Core type furnace: Horizontal & Vertical (Ajax Wyatt)], Indirect Induction Furnace [No Numericals]
- Eddy Current Heating: - Principle, Nature of Supply used, Advantages, Disadvantages & Applications.
- Dielectric Heating: - Principle, Nature of supply used, Advantages, Disadvantages & Applications. [No derivation & Numericals]

<p>Topics 3: Electric Welding Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Compare Methods of Electric Welding ➤ Select type of welding for various applications/jobs <p>Contents:</p> <ul style="list-style-type: none"> • Meaning of the term Welding, Requirements of good welding, Advantages of electric welding, Classifications of welding system, meaning of term plastic & Fusion welding. • Factors Considered while selecting welding System for a particular job, ways and means of avoiding weld defects. • Resistance Welding: types of Resistance welding, principle and operation, applications of each type, advantages & disadvantages, Safety Equipments • Arc Welding: Principle and operation of Metal & Carbon Arc welding, Characteristics of arc, Factors on which arc length depends, methods of stabilization of arc. Types of Electrodes, advantages of coated electrode. Supply requirements, D. C. Straight Polarity and D. C. Reverse Polarity. Use of DCSP for Carbon arc welding. Advantages and Disadvantages and applications. 	08	14
<p>Topics 4: Illumination Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Understand the terms used in illumination System ➤ Describe various lighting schemes with their features <p>Contents:</p> <ul style="list-style-type: none"> • Definition of Light , Luminous flux, Intensity, Lumen, Candle Power, Illumination, Lux or meter Candle, MHCP, MSCP, MHSCP, Reduction factor, lamp efficiency, Specific Consumption, Glare, Space-Height ratio, Utilization Factor, Maintenance Factor , Depreciation Factor, Waste light Factor, Absorption Factor & Reflection Factor, Solid Angle. • Working principle, Construction, Operation and applications of: Fluorescent Tube, CFL, Mercury Vapour, Sodium Vapour and Metal Halide lamps • Types of Lighting Schemes: - direct, Semi-Direct, Indirect & semi-Indirect lighting Schemes with Applications. 	06	08

<p>Topics 5: Electric Traction : Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Select Electric Supply Systems for Electric Traction 		
<ul style="list-style-type: none"> ➤ Decide track electrification system as per requirements <p>Contents:</p> <ul style="list-style-type: none"> • Requirements of an Ideal Traction System. • Different types of Traction System used in India, Advantages & Disadvantages of Electric Traction System. Comparison between various Traction systems. • Systems of Track Electrification: D.C Track Electrification, Single phase 25 KV AC Supply System, Composite System: 1-Phase AC-DC Supply System. Advantages, Disadvantages and Application of above track Electrification System. Comparison between 1-phase 25 KV AC and D.C Track Electrification. • Traction Motors: Desirable Characteristics of an Ideal Traction Motor. • Various types of Traction Motors: Main Features and applications, Advantages and Disadvantages of D.C Series Motor and 1-Phase A.C Series Motor • Traction Motor Control: Steps involved in Series-Parallel Control with Rheostat and their Advantages and Disadvantages • Meaning of the term Transition, Purpose of transition, Steps involved in Shunt Transition & Bridge Transition with advantages and Disadvantages • Traction Mechanics :- Block Diagram of A.C Electric locomotive and function of each part, Classification of Traction Services: Urban, Suburban & Main line Services and their comparison • Speed time Curve: Trapezoidal and Quadrilateral Speed Time curve. Applications. • Definition of average and schedule Speed, Factors affecting Schedule Speed. (Simple Numerical). 	16	24

<p>Topics 6: Tariff : Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Identify type of consumer based on the demand ➤ Decide the Tariff for a consumer <p>Contents:</p> <ul style="list-style-type: none"> • Meaning of the term Tariff, Desirable Characteristics of Tariff System. • Types of Tariff :- Block Rate Tariff, KVA Maximum Demand Tariff (Two part Tariff) & TOD (Time Of Day Tariff), Simple Numericals 	04	06
<p>Topics 7 : Power Factor Improvement :</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Decide the economical size of the P.F. improvement device for minimum cost of energy ➤ Select method of P. F. improvement as per the requirements of consumer <p>Contents:</p> <ul style="list-style-type: none"> • Power Triangle, Disadvantage of low Power factor, Advantages of improved Power Factor. • Causes of Low Power Factor, Avoidance of Low power factor without using P.F. improving apparatus. • P.F. improvement using Static Capacitor: Vector Diagram & Power Triangle , Advantages & Disadvantages and Simple Numericals. • Most Economical Power factor: Derivation & Simple Numericals. • Location of P.F. improving apparatus from Consumer & Electrical Supply Company point of view. 	10	12
Total	64	100

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher
1.	H.Partab	Art & Science of Utilization of Electrical Energy	Dhanpat Rai & Sons
2.	J.B.Gupta	Utilization of Electric Power & Electric Traction	S.K.Kataria & Sons
3.	V.K.Mehta & Rohit Mehta	Principals of Power System	S.Chand

4.	H.Partab	Modern Electric Traction	Dhanpat Rai & Sons
5.	S.Sivanagaraju M.Balasubba Reedy B.Srilatha	Generation & Utilization of Electrical Energy	Pearson

2. IS, BIS and International Codes:

1. IS 1860-1980 code of Practice for Installation, Operation and Maintenance of Electric Passenger and Goods Lifts.
2. IS 3534-1976 Outline Dimensions of Electric Lifts.

3. Websites:

1. sonaversity_org
2. www.animations.physics.unsw.edu.au
3. www.khanacademy.com

Implementation Strategy:

Visits:-

1. Visit to Sugar Industry.
2. Visit to Steel Manufacturing Industry/ Foundry.
3. Visit to welding Workshop.
4. Visit to Locomotive Shed.

These Visits may be arranged under the Subject of Professional Practices.