

COURSE NAME : DIPLOMA IN ELECTRICAL POWER SYSTEM
COURSE CODE : EP/EE
SEMESTER : SIXTH
SUBJECT TITLE : ELECTRIC TRACTION - II (ELECTIVE III FOR EE)
(ELECTIVE II FOR EP)
SUBJECT CODE : 9144

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
03	--	02	03	80	20	--	25@	--	125

Notes: Prerequisite for this subject is Electric Traction – I

Rationale:

Electric traction means a locomotion in which the driving force is obtained from electric motors. One of the practical applications of electricity, which enters into the everyday life of many of us, is its use in service of mass transport – the electric propulsions of vehicles – electric trains, trolley buses, tram cars and in the latest developments such as metro and sky bus.

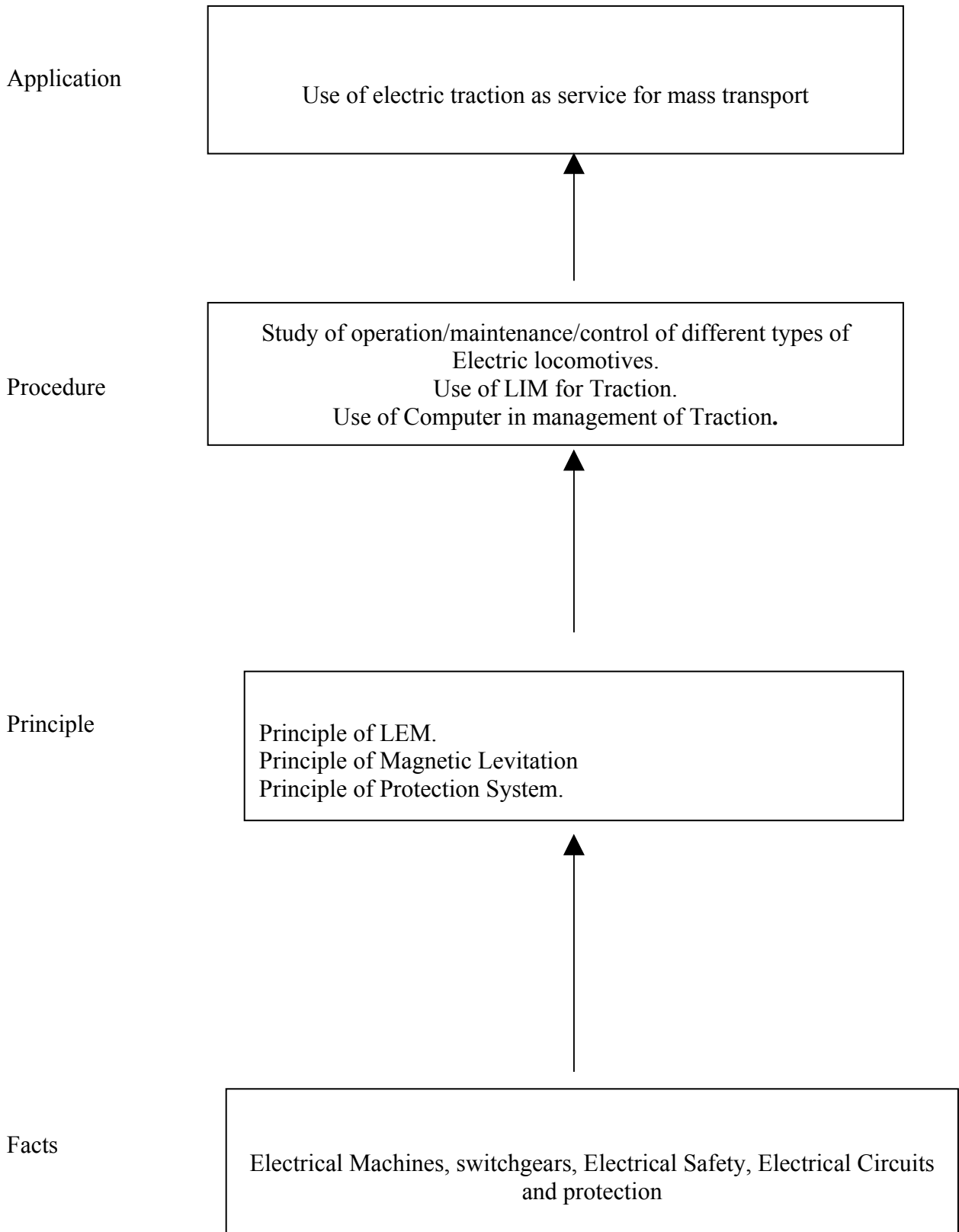
In view of the growing importance and technological developments, which have come about in this area in the recent past; for Electrical Engineering students, it is desirable to study the course dealing with electric traction. This subject belongs to technology area.

Objectives:

The students will be able to,

- (1) List and explain different equipments used in the power circuit and auxiliary circuit of electric locomotives.
- (2) Explain importance of maintenance of electric locomotive.
- (3) State and explain functioning of the protection systems used in electric locomotives.
- (4) Describe the recent trends in electric traction; Such as, LEM propelled Traction.
- (5) Appreciate the use of computers in electric traction management.

Learning Structure:



Contents: Theory:

Chapter	Name of the Topics	Hours	Marks
01	<p>Electric Locomotives:</p> <p>1.1 - Nomenclature used For Electric Locomotives</p> <p>1.2 - Types of Electric Locomotives By Nomenclature.</p> <p>1.3 – AC Locomotive:</p> <p> 1.3.1 - Equipments of AC Electric Locomotive:</p> <p> - Power Circuit Equipments and Auxiliary Circuit Equipments.</p> <p> 1.3.2- Equipments in Power Circuit and their Functions:</p> <p> - Power Circuit Diagram of AC Locomotive: Pantograph, Circuit breaker, Tap Changer Traction Transformer, Rectifier, Smoothing Choke Traction Motor.</p> <p> 1.3.3 - Equipments in Auxiliary Circuit & their Functions: Head Light, Flasher Light, Horn, Marker Light, Batteries, Arno Converter, Blowers, Exhausters Compressors, Selsyn transformer.</p> <p> 1.3.4 – List and Purpose of Different Type of Relays:</p> <p> 1.3.5 – List and Purpose of Different Type of Contactors:</p> <p>1.4 – Three Phase Locomotive.</p> <p> 1.4.1 – Power Circuit of Three Phase Locomotive.</p> <p> 1.4.2 – Power Supply Arrangement for Auxiliary Machines in Three Phase Locomotive.</p>	14	20
02	<p>Maintenance of Locomotives:</p> <p>2.1 – Locomotive Maintenance</p> <p>2.2 – Need of Maintenance and Policy of Obselence.</p> <p>2.3 – Defects.</p> <p>2.4 – Ideal Maintenance:</p> <p> - Means to Improve the Reliability of Locomotive.</p> <p> - Means to Improve Availability of Locomotive.</p> <p> - Means to Reduce Maintenance Cost.</p> <p> - Maintenance Record.</p> <p> - Training Facility.</p> <p> - Characteristics of Efficient Maintenance.</p> <p>2.5 – Electrical Faults and Their Causes.</p> <p>2.6 – Fault Localisation.</p> <p>2.7 – Necessity of Testing.</p> <p> - Testing Procedure.</p> <p> - Individual Equipment Tests.</p>	10	20
03	<p>Protection of Electric Locomotive:</p> <p>3.1 – Introduction.</p> <p>3.2 – Broad Strategy For Protection.</p> <p>3.3 – Surge Protection:</p> <p> - Direct Lightening Strokes.</p> <p> - Switching Surges: External and Internal.</p> <p>3.4 – Overload Protection of Main Power Circuit.</p> <p>3.5 – Earth Fault Protection of Power and Auxiliary Circuit.</p> <p>3.6 – Protection from Over Voltage and Under Voltage.</p>	08	16

	<p>3.7 – Differential Current Protection of Traction Circuits.</p> <p>3.8 – Protection Against High and Low Air Pressure in the Compressed Air Circuit.</p> <p>3.9 – Temperature Monitoring.</p> <p>3.10 – Protection of Transformer By Buchholz’s Relay.</p> <p>3.11 – Monitoring of Ventilation System of Key Locomotive Equipments.</p> <p>3.12 – Protection Against Accidental Contact with HT Equipment.</p> <p>3.13 – Protection Against Fire.</p> <p>- Fire Prevention Strategy.</p>		
04	<p>LEM Propelled Traction:</p> <p>4.1 – Introduction.</p> <p>4.2 – Linear Electric Motor (LEM)</p> <p>4.3 – Linear Induction Based Traction System:</p> <ul style="list-style-type: none"> - Moving Primary Fixed Secondary Single Sided LIM. - Moving Secondary Fixed Primary Single Sided LIM. - Moving Primary Fixed Secondary Double Sided LIM. <p>4.4 – Strengths/Weaknesses of LIM Propelled Railway Traction:</p> <ul style="list-style-type: none"> - Strengths of LIM Propelled Railway Traction System. - Weaknesses of LIM Propelled Railway Traction System. <p>4.5 – Practical Possibilities of LIM Propelled Transportation.</p> <p>4.6 – Inputs/Modifications for Adoption of LIM Propulsion in the Existing System:</p> <ul style="list-style-type: none"> - Track Modification. - Vehicle Modification. - Voltage and Speed Control. <p>4.7 – LIM Propelled Underground Metro Rail System:</p> <ul style="list-style-type: none"> - Factors Influencing Adoption of LIM for Metro Rail. - International Scenario. <p>4.8 – Wheel Less Traction:</p> <ul style="list-style-type: none"> - Levitation Schemes. - Present Scenario. 	10	12
05	<p>Application of Computers in Management of Electric Traction:</p> <p>5.1 – Introduction.</p> <p>5.2 – Computer’s Capability Relevant to Electric Traction Management.</p> <p>5.3 – Areas of Computer Application in Traction System Management:</p> <ul style="list-style-type: none"> - Optimisation of OHE and Power Supply Installation Designs. - Computer Aided Locomotive Designs. - Monitoring of Maximum Demand. - Energy Saving Driving Approach. 	06	12

	<ul style="list-style-type: none"> - Training of Drivers on Simulators. - Aiding Drivers and Maintenance Depot Through On Board Computers - History of Locomotive and OHE Equipment. - Failure Analysis. - Monitoring Execution of Trip Inspection - Schedules of Locomotives. - Inventory Control. <p>5.4 – Possible Other Areas for Computer Controlled Monitoring.</p> <p>5.5 – Advantages of Use of Computers for Management of Electric Traction System.</p>		
Total		48	80

Assignments:

Drawing Sheets:

- (i) Drawing (on half Imperial sheet) for Power Circuit of any type of Electric Locomotive
- (ii) Drawing (on half Imperial sheet) for Protection of Electric Locomotive.

(**Note:** Students should be able to identify, explain the functions of various equipments used in Electric locomotive).

Mini Project:

Collection of information using Internet on any two topics in the contents and submission of printouts

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
1.	H. Partab	Modern Electric Traction	Dhanpat Rai & Sons
2.	J. Upadhyay S. N. Mahendra	Electric Traction	Allied Publishers Ltd.
3.	Om Prakash Kesari	Viddut Engine Parichay (In Hindi)	S. P. Graphics, Nashik. Phone No. (0253) 2580882