

COURSE NAME : DIPLOMA IN ELECTRICAL POWER SYSTEM
COURSE CODE : EP/EE
SEMESTER : SIXTH
SUBJECT TITLE : TESTING & MAINTENANCE OF ELECTRICAL MACHINES
SUBJECT CODE : 9142

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
03	--	02	03	80	20	50#	--	25@	175

Rationale:

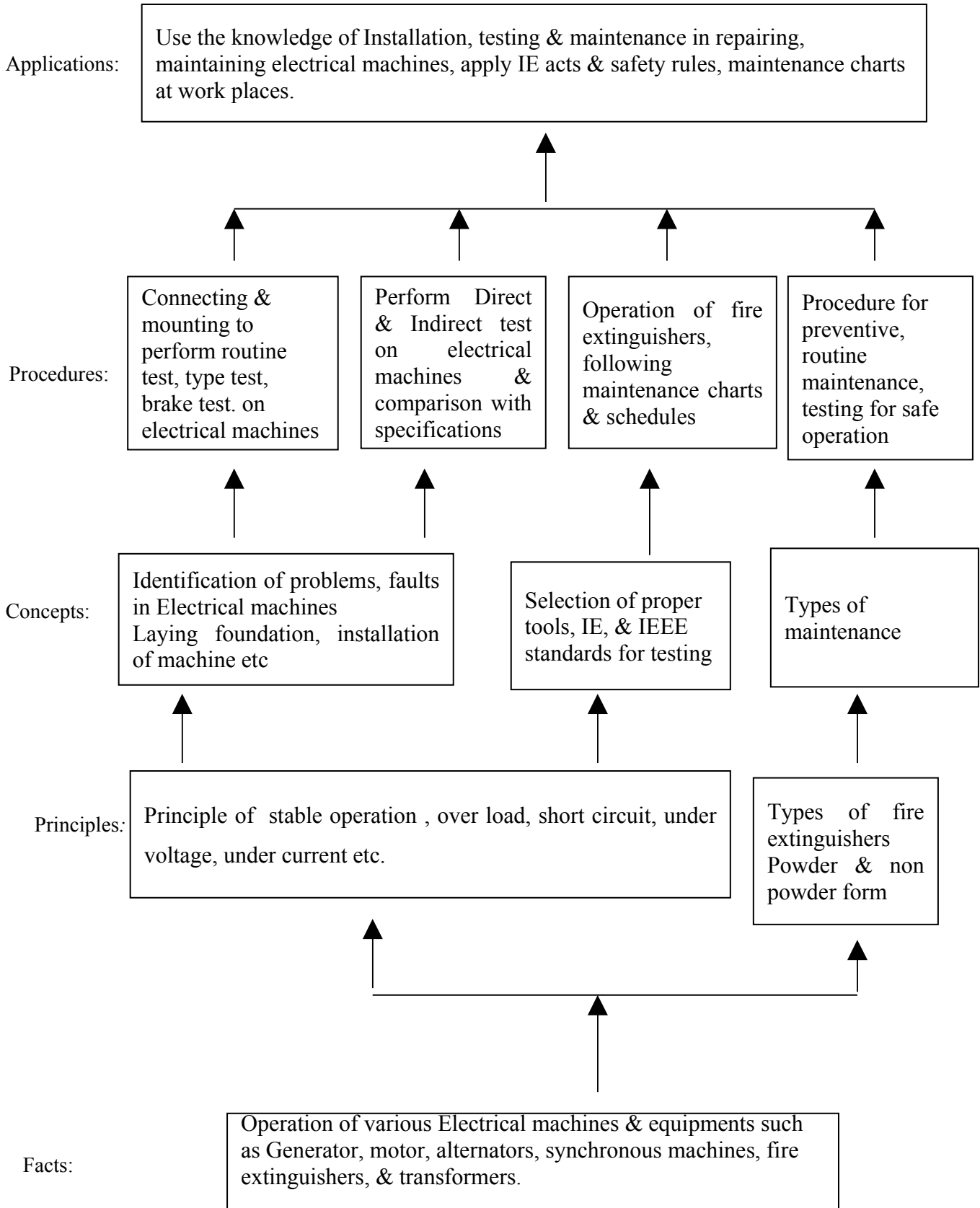
This is technology level subject with application in Industry, commercial, public utility departments such as PWD, Irrigation, MSEB, water supply & sewage board etc. After studying this subject student will be able to inspect, test, install & commission electrical machines as per IS and International standards. He/She shall carry out routine & preventive maintenance of electrical machines & possesses knowledge of Indian Electricity Act, safety rules, safety of machines & persons, prevention of accident. This will help him to initiate total productive maintenance.

Objective:

Student will be able to

1. Know safety measures & state safety precautions.
2. Test single phase, three phase transformer, DC & AC machine as per IS.
3. Identify / Locate common troubles in electrical machines & switch gear.
4. Plan & carry out routine & preventive maintenance.
5. Install LV switchgear & maintain it.
6. Ascertain the condition of insulation & revarnishing if necessary.
7. Initiate total productive maintenance.

Learning structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	<p>Safety & Prevention of Accidents: Definition of terminology used in safety; safety, hazard, accident, major accident hazard, responsibility, authority, accountability, monitoring, I.E. Act & statutory regulations for safety of persons & equipments working with electrical installation, Dos & don'ts for substation operators as listed in IS Meaning & causes of electrical accidents factors on which severity of shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration, Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers.</p>	04	08
02	<p>General Introduction: Objectives of testing significance of I.S.S. concept of tolerance, routine tests, type tests, special tests. Methods of testing a) Direct, b) Indirect, c) Regenerative. Concept of routine, preventive & breakdown maintenance, advantages of preventive maintenance, procedure for developing preventive maintenance schedule, Factors affecting preventive maintenance schedule. Introduction to total productive maintenance.</p>	07	12
03	<p>Testing & maintenance of rotating machines: Type tests, routine tests & special tests of 1 & 3 phase Induction motors, Routine, Preventive, & breakdown maintenance of 1 & 3 phase Induction motors as per IS 9001:1992 Parallel operation of alternators, Maintenance schedule of alternators & synchronous machines as per IS 4884-1968 Brake test on DC Series motor.</p>	05	08
04	<p>Testing & maintenance of Transformers: Listing type test, routine test & special test as per I.S. 2026-1981 Procedure for conducting following tests: Measurement of winding resistance, no load losses, & no load current, Impedance voltage, load losses, Insulation resistance, Induced over voltage withstand test, separate source voltage withstand test, Impulse voltage withstand test, Temperature rise test of oil & winding, Different methods of determining temp rise-back to back test, short circuit test, open delta (delta – delta) test. Preventive maintenance & routine maintenance of distribution transformer as per I.S. 10028(part III): 1981, Periodic checks for replacement of oil, silica gel, parallel operation of 1 & 3 phase transformer, load sharing calculations (numerical)</p>	12	18
05	<p>Testing & maintenance of Insulation: Classification of insulating materials as per I.S. 8504(part III)1994, factors affecting life of insulating materials, measurement of insulation resistance & interpretation of condition of insulating. Methods of measuring temperature of internal parts of windings/machines & applying the correction factor when the machine is hot. Properties of good transformer oil, list the agents which contaminates the insulating oil, understand the procedure of following tests on oil as per I.S. 1692-1978</p>	08	14

	<p>a) acidity test b) sludge test c) crackle test e) flash point test. Filtration of insulating oil protection of electrical equipments (insulation) during the period of inactivity. Methods of cleaning the insulation covered with loose, dry dust, sticky dirt, & oily viscous films, procedure for cleaning washing & drying of insulation & revarnishing Methods of internal heating & vacuum impregnation.</p>		
06	<p>Trouble shooting of Electrical Machines & Switch gear: Significance of trouble shooting of various electrical machines and describes the procedure for the same. Internal and external causes of failure of equipment. Various types of faults (mechanical, electrical & magnetic) in electrical machines reason for their occurrence, use of following tools: Bearing puller, Filler gauge, dial indicator, spirit level megger, earth tester, growler, multimeter, Trouble shooting charts for 1 & 3-phase induction motor, 1 & 3- phase transformer. List the common troubles in electrical installation & cables Maintenance & trouble shooting of LV switchgear like MCCB, ELCB, contactors & batteries.</p>	08	12
07	<p>Installation: Factors involved in designing the machine foundation, Requirement of different dimension of foundation for static & rotating machines procedure for levelling & alignment of two shafts of directly & indirectly coupled drives, effects of misalignment. Installation of rotating machines as per I.S. 900-1992. Use of various devices & tools in loading & unloading, lifting, carrying heavy equipment.</p>	04	08
Total		48	80

Practical:

Skills to be developed:

Intellectual skills:

1. Select appropriate meters & equipment
2. Recollect Testing & Maintenance procedures.

Motor Skills:

1. Accuracy of Measurement
2. Proper connections
3. Draw characteristics

List of Practical:

- 1) Draw circuit diagram select appropriate meters, connect it to perform routine test on single phase Induction motor
- 2) As per the given circuit diagram perform routine test on three phase Induction motor, & calculate the different parameters
- 3) Select two single phase transformers, perform polarity test, mark its terminals, select appropriate meters & perform back to back test, compare its regulation with direct loading method
- 4) Perform parallel operation of transformer as per I.S.
- 5) Perform parallel operation of alternator as per I.S.
- 6) Carry out OC & SC test on Induction motor, plot circle diagram, & calculate parameters
- 7) Perform brake test on DC series motor & plot characteristic of output against torque, speed, load current as per I. S. list suitable applications.

B) Field work:

- 8) Observe & carry out weekly, monthly & yearly maintenance of motor in your workshop & prepare its report

C) Mini project:

- 9) Prepare trouble-shooting chart for single and three phase transformers
- 10) Prepare trouble-shooting chart for single and three phase motors

Learning Resources:**Books:**

Sr. No.	Author	Title	Publisher
01	B. L. Theraja	Electrical Technology Vol I To IV	S. Chand & Co., New Delhi
02	B. V. S. Rao	Operation & Maintenance Of Electrical Machines Vol - I	Media Promoters & Publisher Ltd. Mumbai
03	B. V. S. Rao	Operation & Maintenance Of Electrical Machines Vol - II	Media Promoters & Publisher Ltd. Mumbai
04	C.J. Hubert	Preventive Maintenance Hand Books & Journals	-----