5104 – TESTING AND MAINTENANCE OF ELECTRICAL EQUIPMENT

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)					
					Theory		Practical Ex.		Total	
Lectures	Practical	Credits								
3	2	5	25	25	3 Hrs	100	50		200	

Pre-requisite	Source
4106	ELL

Semester	Theory	Test	Total	TW	PR	Gr Total
4	75	25	100	25	50	175

Rationale: This course will enable a learner to identify the various types of existing tests to be performed on various types of A.C. and D.C. machines. The learner gets acquainted with the exact procedure to be adopted for carrying out such tests as well as storage and maintenance schedule for each of these machines.

COURSE CONTENTS	Hrs	Mks
1. CLASSIFICATION OF TEST Type test, Routine test, acceptance test, pre-commissioning/commissioning test. Methods of measurement of temperature rise of various parts of machines. Concept of direct and indirect, Regenerative testing (Phantom loading), advantages and disadvantages	4	8
2. D.C. MACHINES TESTING Classification of various losses in D.C. machines as per I.S. and separation of various losses, Calculation of Mechanical, electrical and overall efficiency. Determination of efficiency by direct, indirect and regenerative methods (brake test, Swinburn test and Hopkinson test)	8	16
3. TRANSFORMER TESTING Tests and their importance on transformer – Phasing out test, ratio and polarity test,	10	24

Measurement of winding resistances, insulation resistance test, Measurement of no load losses and no load current, S.C. test and measurement of load losses. Temperature rise test a) Direct load test, b) Back to back test/Sumpener's test, c) Short circuit test, - Methods of measurement of temperature rise and permissible temperature rise as per IS. Calculation of parameters of equivalent circuit, efficiency and regulation using data from various tests, High voltage and Impulse voltage with stand test, Acceptance test.

4. INDUCTION MOTOR TESTING Various types of losses in motor, calculation of rotor input power, rotor output power, mechanical power developed and motor output, Classification of tests: - Type test, routine test and special test as per IS 325-1970. Load test, measurement of temperature of various parts of induction motor (temperature rise test), insulation resistance test and high voltage test, acceptance test	12	24
5. TESTING OF SYNCHRONOUS MACHINES Calculation of losses, determination of losses, and computation of efficiency from losses as per IS 4389-1968	4	8
6. TESTING AND MAINTENANCE SCHEDULE Storage, testing and maintenance schedule for transformer and induction machine as per I.S. Care of electrical equipment during period inactivity and storage. Pre-commissioning testing and maintenance. Installation. Maintenance schedule for transformer and induction machine as per IS. Revarnishing process of winding of electrical equipment – Vacuum impregnation, dip impregnation and coating. Causes of failure, its frequency of occurrence and trouble shooting in transformers. Causes of failure, its frequency of occurrence and trouble shooting in induction machines.	10	20
Total	48	100

LIST OF PRACTICAL:

1. To perform brake test on D.C. shunt motor & calculation of its efficiency.
2. To perform Swinburn's test on D.C. shunt motor, calculate the various losses and determine its efficiency as motor and generator.
3. To perform Hopkinson's test on D.C. machines and calculation of efficiency.
4. To perform back to back test on transformer, to determine the losses & calculation of efficiency as well as regulation.
5. To perform vector group test on three phase transformer.
6. To perform reduced voltage running up test on a three phase induction motor at various loads such as (1) No load, (2) ¼ of full load, (3) ½ full load.
7. To perform continuity test and insulation resistance test on windings of three phase induction motor.
8. To perform temperature rise test in a three induction motor.
9. To perform direct load test to determine efficiency in an alternator.
10. To perform temperature rise test in transformer by (a) winding resistance measurement (by using multimeter) (b) Therometer.

REFERENCE BOOKS:

1. Testing, Commissioning, Operation and maintenance of Electrical Equipment, S. S. Rao.
2. Electrical Machines, S. K. Bhattacharya.
3. Preventive Maintenance of Electrical appliances, S. K. Sharotri.
4. Operation and maintenance of Electrical Equipment, B. V. S. Rao.
5. Design and testing of Electrical Machines, M. V. Deshpande.