

Subject Code: 1ET4030601	Subject Title: ELECTRICAL INSTALLATION, COMMISSIONING AND MAINTENANCE
Pre-Requisite	--

RATIONALE:

Electrical Power system consists of a number of transformers, circuit breakers and other equipments which require installation, commissioning and regular maintenance to prevent permanent break down. Many times an engineering diploma holder has to carryout/supervises installation, commissioning and maintenance of various electrical equipments in power stations, substations and industry. This course will enable the diploma pass out student to understand the concepts, principles and acquire basic skills of installation, commissioning and maintenance of electrical equipments in power stations, substations and industry.

COURSE OBJECTIVE:

The course content should be taught and implemented with an aim to develop different skills

1. Unload the electrical equipments/machines based on scientific procedure.
2. Commission various electrical equipment/machines
3. Prepare maintenance schedule of different equipment and machines
4. Prepare trouble shooting chart for various electrical equipment, machines and domestic appliances
5. Carry out different types of Earthing.
6. Apply Electrical safety regulations and rules during maintenance.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment
4	0	2	5	60	40	20	30

DETAILS OF COURSE CONTENTS:

Sr No	Topics and Sub-topics	Total Hours	% Weightage
1 Installation of Electrical Equipments	1.1 Unloading of Electrical equipment at site 1.2 Inspection of electrical equipment at site 1.3 Storage electrical equipment at site 1.4 Foundation electrical equipment at site 1.5 Alignment of electrical machines 1.6 Tools/Instruments necessary for installation 1.7 Technical report, Inspection, storage and handling of transformer, switchgear and motors	06	15

2 Commissioning and Testing	2.1 Tests before commissioning of electrical equipment-Electrical and Mechanical test, Preparations before commissioning of power transformer, Instruments required for testing 2.2 Specific tests on -Transformer, Induction motor, alternator, synchronous motor 2.3 Commissioning of power transformer, three phase induction motor and switchgear 2.4 Transformer insulation oil: Properties as per IS, sampling, testing and filtering/purifying, standard tests as per IS, classification of insulation resistance 2.5 Measurement of insulation resistance and Polarization Index, Factors affecting the insulation resistance of insulating materials 2.6 Drying the winding of electrical equipment and its record 2.7 Tests after and before commissioning the machine 2.8 Test report on commissioning and test certificate Gradually loading of electrical equipment	14	20
3 Maintenance Of Electrical Equipments	3.1 Functions of the Maintenance Department; Reasons of failure of electrical equipment 3.2 Preventive maintenance: need, classification, advantages, activities Frequency of maintenance 3.3 Breakdown maintenance: concept, advantages, activities 3.4 Factors for preparing maintenance schedule 3.5 Maintenance schedule of transformer below and above 1000kVA 3.6 Maintenance schedule - induction motor, circuit Breaker, overhead line, storage Battery 3.7 Probable faults due to poor maintenance in transformer, induction motor, circuit breaker, overhead lines and battery	12	15
4 Trouble Shooting	4.1 Causes of faults in electrical equipment (Internal and external) 4.2 Instruments and tools for troubleshooting 4.3 Common troubles in electrical equipment- DC Machines, AC Machines, Transformers, Circuit-breaker, under- ground cable, electrical Installation 4.4 Need of trouble shooting chart, 4.5 Trouble shooting chart for DC Motor, DC Generator, Transformer, Synchronous Motor, Induction Motor, Circuit-breaker 4.6 Trouble shooting chart for Domestic appliances- electrical iron, ceiling fan, Washing machine, Air cooler, Vacuum cleaner, Fluorescent tube light:	09	20

	Construction, working and trouble shooting chart		
5 Earthing	5.1 Necessity of earthing 5.2 System earthing: advantage of neutral earthing of generator in power station 5.3 Equipment earthing: Objective 5.4 Types of earth electrodes 5.5 Methods of earthing : plate earthing ,pipe earthing and coil earthing 5.6 Earthing in extra high voltage and underground cable, Earthing resistance- factors affecting, Determination of maximum permissible resistance of the earthing system 5.7 Measurement of earth resistance: voltmeter-ammeter method, earth tester method, ohm meter method and earth loop tester method 5.8 Comparison between equipment earthing and system grounding. 5.9 Earthing procedure- Building Installation, Domestic appliances, Industrial premises, Earthing of substation, generating station and overhead line.	09	20
6 Electrical Accidents and Safety	6.1 Causes of Electrical Accidents. 6.2 Factors affecting the severity of electrical shock. 6.3 Action to be taken when a person gets attach to live part. 6.4 Safety regulation and safety Measures. 6.5 Substation Shut down Procedure 6.6 Permit to Work 6.7 Safety Instructions for Working on Low, Medium and High Voltage Mains and Apparatus. 6.8 Fire Extinguishers.	06	10

COURSE OUTCOME:

The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:

1. Understand the Procedure of unload the electrical equipments/machines.
2. Understand the Methods of Commission various electrical equipment/machines
3. Able to Prepare maintenance schedule of different equipment and machines
4. Understand and able to Prepare trouble shooting chart for various electrical equipment, machines and domestic appliances
5. Understand the necessity of earthings and its Methods.
6. Understand the Electrical safety regulations and rules.

LIST OF PRACTICAL:

1	Prepare complete layout of wiring for installation of given machine with specifications.
2	To prepare test report after commissioning of an electrical machine.
3	Perform various tests on insulating oil.
4	Measurement of insulation resistance of a wiring installation with the help of Megger.
5	Prepare maintenance schedule for power transformer.
6	Prepare maintenance schedule for induction motor.
7	To study dismantling and trouble shooting of ceiling fan.
8	To study dismantling and trouble shooting of fluorescent tube light.
9	Prepare plate / pipe earthing as per is and measure earth resistance.
10	Interpret Indian electricity rules pertaining to safety.
11	To study of the action to be taken when a person comes in contact with a live wire.
12	Study of different Fire Extinguishers.

LIST OF REFERENCES:

1. Testing Commissioning operation and maintenance of Electrical Equipment's by Rao S, Khanna Publication New Delhi.
2. Testing Commissioning operation and maintenance of Electrical Equipment's. By Singh Tarlof, S.K.Kataria and Sons, New Delhi, Second edition-2012.
3. Electrical Power System By Wadhwa C.L, New Age international Publications, New Delhi
4. <http://cercind.gov.in/ElectSupplyAct1948.pdf>
5. www.lce.com/pdfs/The-PMPdM-Program-124.pdf
6. www.iapa.ca/pdf/prevent.pdf
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