

4EE53: COMMISSIONING OF ELECTRICAL EQUIPMENTS
CREDITS: 3 (LTP: 3, 0, 0)

Course Objective:

To explain the basic concepts of testing, commissioning, maintenance and supervises of various electrical equipment.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE	CE	ESE	CE		
3	0	0	3	60	40	00	00	100

Course Contents:

Unit No.	Topic	Teaching Hours
1.	Safety Management: Objectives, safety management during operation and maintenance, clearance and creepages, electric shock, need of earthing, different methods of earthing, factors affecting the earth resistance, methods of measuring the earth resistance, equipment earthing and system grounding, earthing procedure-building installation, domestic appliances, industrial premises, earthing of substation, generating station and overhead line.	05
2.	Installation of Electrical Equipment: Inspection of electrical equipment at site, storage electrical equipment at site, foundation of electrical equipment at site, alignment of electrical machines, tools/instruments necessary for installation, technical report, inspection, storage and handling of transformer, switchgear and motors, introduction to megger and earth resistance tester and their applications.	04
3.	Testing of Transformer, Plant and Equipment: General requirements for type, routine and special tests, measurement of winding resistance; measurement of voltage ratio and check of voltage vector relationship; measurement of impedance voltage/short-circuit impedance and load loss; measurement of no-load loss and current; measurement of insulation resistance; dielectric tests; temperature-rise, insulation and HV test, dielectric absorption, switching impulse test, testing of current transformer and voltage transformer, power transformer, distribution transformer, CVT and special transformer with reference to Indian Standard (IS). Drying out procedure for transformer. PI index, commissioning steps for transformer, troubleshooting & maintenance of transformer.	13

Unit No.	Topic	Teaching Hours
	[Ref:IS2026: Part_1-10-PowerTransformers: Methods of Test; IS13956:1994-Testing Transformers]	
4.	Installation and Commissioning of Rotating Electrical Machines: Degree of protection, cooling system, degree of cooling with IP- IC code (brief discussion), enclosures, rating of industrial rotating electric machine, installation, commissioning and protection of induction motor and rotating electric machine, drying out of electric rotating machine, insulation resistance measurement, site testing and checking, care, services and maintenance of motors, commissioning of synchronous generator, protection and automation of synchronous generator, synchronous motor, D.C. generator and motor with reference to Indian Standard (IS). [Ref: IS 4029:2010-Guide for Testing Three Phase Induction Motors; IS 7132:1973-Guide for Testing Synchronous Machines; IS 9320:1979-Guide for Testing of Direct Current (dc) Machines]	12
5	Switch Gear & Protective Devices: Standards, classification, specification, rating and duties of CB, installation, commissioning tests, maintenance schedule, type & routine tests, operation of sub-station (steps) for line circuit breaker maintenance, location of lightning arrester with reasons.	04
6	Transmission line: Commissioning of A.C transmission line and HVDC transmission, galvanize steel structure, towers and insulator for transmission and distribution line, tower footing resistance, substation equipment, bus bar system, power cable, low power control cable, contactor, GIS (gas insulated substation).	04
Total		42

List of References:

1. Rao, S., "Testing, commissioning, operation and maintenance of electrical equipment", 6th edition., Khanna Publishers, NewDelhi
2. Paul Gill, "Electrical power equipment maintenance and testing", CRC Press,2008.
3. SinghTarlok, "Installation, commissioning and maintenance of Electrical equipment", S.K.Kataria and Sons, NewDelhi,
4. Philip Kiameh, "Electrical Equipment Handbook: Troubleshooting and Maintenance", McGraw- Hill,2003.
5. Relevant Indian Standards (IS Code) and IEEE Standards for-Installation, maintenance and commissioning of electrical equipment's /machines.
6. R.C.H. Richardson, "Commissioning of Electrical Plant and Associated Problems" , Chapman and Hall Ltd., 196

Web Resources:

1. <http://www.bis.org.in/index.asp>
2. <http://164.100.105.199:8071/php/BIS/IndStndrdLocatr/StandrdsSelection.php>
3. http://www.ieee.org/publications_standards/publications_standards_index.html
4. <http://www.nema.org/Standards/About-Standards/pages/default.aspx>
5. <http://www.electricalsafetyfirst.org.uk/guides-and-advice/around-the-home/first-aid/>

Course Outcomes (Cos):

At the end of this course students will demonstrate the ability to:

1. Familiar about electrical safety regulations and rules during maintenance.
2. Procedure of different types of earthing for different types of electrical installations.
3. Preparation of maintenance schedule of different equipment and machines.
4. Trouble shooting chart for various electrical equipment's, machines and domestic appliances.