

Course Title	Electrical Machines	
Course Code	EL3XX	
Course Credit	Lecture	: 03
	Practical	: 01
	Tutorial	: 00
	Total	: 04
Course Learning Objectives		
<p>At the end of this course students will be able to:</p> <ul style="list-style-type: none"> • Understand the construction, operating principle and testing of transformer. • Examine various starting methods of induction motor. • Discriminate types of DC machines and its characteristics. • Recognize the various conditions for parallel operation of synchronous machines. 		
Detailed Syllabus		
Sr. No.	Name of chapter & details	Hours Allotted
Section – I		
1	<p>Transformer</p> <p>Operating principle, Ideal transformer, EMF equation, Voltage and current transformation, Transformer on no load and on load, Phasor diagram of actual transformer on load, Equivalent circuit of transformer, Transformer losses, Testing of transformer, Auto transformer.</p>	10
2	<p>Induction Machine</p> <p>Three phase induction motor</p> <p>Construction, Principle of operation, Slip, Torque equation and characteristics, Testing on induction motor, Equivalent circuit of induction motor, Speed control of induction motor,</p> <p>Single phase induction motor:</p> <p>Production of magnetic field (Two field Revolving theory), Starting methods for induction motor, Application.</p>	11

Section – II

4	<p>DC Machines</p> <p>DC generator</p> <p>Working Principle of Generator, Construction of DC Machines, EMF equation, Classification of DC Generators, Armature reaction and commutation, Characteristic of DC generators.</p> <p>DC motor</p> <p>Working principle, Back EMF, Types of DC motor, Speed equation, Operating characteristics of DC motor, Testing of DC motor, Different starter for DC motor.</p>	14
5	<p>Synchronous Machines</p> <p>Synchronous Generator (Alternator)</p> <p>Construction of synchronous generator, Types of synchronous generator, EMF equation, Parallel operation of synchronous generator and load sharing.</p> <p>Synchronous motor</p> <p>Construction, Principle of operation, Starting methods of synchronous motors, Application.</p>	07

Instructional Method and Pedagogy

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum ten experiments shall be there in the laboratory related to course contents.

Reference Books

1. J B Gupta “*Theory & Performance of Electrical Machines*”, S. K. Katariya & Sons Publication.
2. B L Theraja “*Electrical Technology Vol IP*”, S Chand Publication.
3. Ashfaq Husain “*Electric Machines*”, Dhanpat Rai & Co.

4. I. J. Nagrath and Kothari “*Electric Machines*”, Tata McGraw hill.

Additional Resources

NPTEL web/video lectures([LINK](#))

Sr .	Experiment
1	Discuss the construction and working principle of transformer.
2	Describe the construction and working principle of D.C. Machine.
3	Test voltage ratio test and polarity test of single phase transformer.
4	Perform open circuit (O.C.) and short circuit (S.C.) test on single phase transformer.
5	Develop magnetization characteristic (O.C.C.) of a D.C. generator.
6	Develop internal & external characteristic of D.C. shunt generator.
7	Analyze the different starter for D.C. motor.
8	Perform brake test on D.C. Shunt motor.
9	Perform Swinburne’s test on D.C. Shunt motor.
10	Perform load test on 3-phase induction motor.
11	Perform no load test & block rotor test on three phase induction motor.
12	Examine the starting methods of induction motor.
13	Discriminate the speed control methods of induction motor.
14	Examine the starting methods of synchronous motor.
15	Develop the regulation of a 3-ph alternator by open circuit & short tests.