

# ELECTRICAL MACHINES

IV Year II Semester  
17EE843

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## (OPEN ELECTIVE - II)

### Preamble

This is a basic course on stationary and rotating electrical machines. This course covers the topics related to principles, performance, applications and design considerations of stationary and rotating electrical machines.

### Learning objectives

- To Understand the unifying principle of operation and applications of Single-Phase Transformers.
- To Understand the unifying principle of operation and applications of DC Generators.
- To Understand the unifying principle of operation and applications of DC Motors.
- To Understand the unifying principle of operation and applications of Three Phase Induction Motor.
- To Understand the unifying principle of Three Phase Synchronous Generators.
- To Understand the unifying principle of Single-Phase Motors.

### Unit-1

#### Single-Phase Transformers:

Faraday's Laws of Electromagnetic Induction, Types of Induced EMF, Lenz's Law, need of transformer in an electrical power system network, working principle of Single-Phase transformer, Emfequation, Coreand Shell Type Transformers, Applications of different Types of Transformers.

### Unit-2

#### DC Generators:

Dynamically Induced EMF, Fleming's Right Hand Rule, working principle of DC Generator, EMF Equation, Classification of DC Generators based on excitation, Applications of different Types of DC Generators.

### Unit-3

#### DC Motors:

Fleming's Left-Hand Rule, working principle of DC Motor, Phenomenon of Back-Emf, Expression for Torque produced, classification of DC Motors, Applications of different types of DCMotors.

### Unit-4

#### Three Phase Induction Motor:

Types of Magnetic fields, Production of Rotating Magnetic Field by balanced 3-Phase AC Supply, working principle of Three Phase Induction Motor, constructional details, Types, Applications of different types of Three Phase Induction Motors.

### Unit-5

#### Three Phase Synchronous Generators:

Role of Three Phase Synchronous Generators in power plants, working principle of Three Phase Synchronous Generators, Constructional details, Types of Synchronous Generators, Emf equation, Applications of different types of Synchronous Generators.

## **Unit-6**

### **Single Phase Motors**

Concept of Double Revolving field theory, Production of Rotating Magnetic Field by two phase AC supply, working principle of single-phase induction motor, Classification of Split Phase Induction Motors, Shaded Pole Induction Motor, Applications different types of Split Phase Induction Motors.

#### **Learning outcomes:**

- Able to Understand the unifying principle of Single-Phase Transformers.
- Able to Understand the unifying principle of DC Generators.
- Able to Understand the unifying principle of DC Motors.
- Able to Understand the unifying principle of Three Phase Induction Motor.
- Able to Understand the unifying principle of Three Phase Synchronous Generators.
- Able to Understand the unifying principle of Single-Phase Motors.

#### **Text Books:**

1. Electrical Machines–P.S. Bhimbra, Khanna Publishers
2. Electric Machinery by A.E.Fitzgerald, Charles Kingsley, Stephen D. Umans, TMH

#### **Reference Books:**

1. Electrical Machines by D. P. Kothari, I. J. Nagarth, McGraw Hill Publications, 4th edition
2. Electrical Machines by R. K. Rajput, Lakshmi publications, 5<sup>th</sup> edition.
3. Electrical Machinery by Abijith Chakrabarthi and Sudhipta Debnath, McGraw Hill education 2015.
4. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2010
5. Theory & Performance of Electrical Machines by J. B. Gupta. S. K. Kataria & Sons