EE2251   **ELECTRICAL MACHINES - I**   **L T P C**
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1. INTRODUCTION   6

Electrical machine types – Magnetic circuits – Inductance – Statically and Dynamically induced EMF - Torque – Hysteresis- Core losses - AC operation of magnetic circuits.

2. TRANSFORMERS   10

Construction – principle of operation – equivalent circuit – losses – testing – efficiency and voltage regulation – auto transformer – three phase connections – parallel operation of transformers – tap changing.

3. ELECTROMECHANICAL ENERGY CONVERSION   9

Energy in magnetic systems – field energy, coenergy and mechanical force – singly and multiply excited systems.

4. BASIC CONCEPTS IN ROTATING MACHINES   9

Generated voltages in ac and dc machines, mmf of distributed windings – magnetic fields in rotating machines – rotating mmf waves – torque in ac and dc machines.

5. DC MACHINES   11

Construction – EMF and torque – circuit model – armature reaction – commutation –methods of excitation – characteristics of generators – characteristics of motors –starting and speed control – testing and efficiency – parallel operation.

                                                      L = 45 T = 15 Total = 60

TEXT BOOK

1. Nagrath I. J and Kothari D. P. 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 1990.

2. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCES

1. Fitzgerald.A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', McGraw Hill Books Company, 1992.

2. P. C. Sen., 'Principles of Electrical Machines and Power Electronics', John Wiley&Sons, 1997.

3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd,2002..

EE 2251- ELECTRICAL MACHINES - I

DESCRIPTION:

A DC generator produces direct current electrical power from mechanical energy. A DC generator can operate at any speed within mechanical limits and always output a direct current waveform. Direct current generators known as dynamos work on exactly the same principles as alternators, but have a commutator on the rotating shaft which convert the alternating current produced by the armature to direct current.

The brushed DC electric motor generates torque directly from DC power supplied to the motor by using internal commutation, stationary permanent magnets, and rotating electrical magnets. Brushes and springs carry the electric current from the commutator to the spinning wire windings of the rotor inside the motor.

A transformer is a static device that converts alternating current from one voltage level to another level (higher or lower), or to the same level, without changing the frequency. A transformer transfers electrical energy from one circuit to another through inductively coupled conductors—the transformer's coils. A varying electric current in the first or primarywinding creates a varying magnetic flux in the transformer's core and thus a varying magnetic field through the secondary winding.

OBJECTIVE:

i. To familiarize the constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
ii. To introduce the principles of electromechanical energy conversion in singly and multiply excited systems.
iii. To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
iv. To study the working principles of DC machines as Generator and Motor, types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
v. To estimate the various losses taking place in D.C. machines and to study the different testing methods to arrive at their performance.

SARDAR RAJA COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
<u>MICRO LESSON PLAN</u>

No of hours	LECTUR TOPICS	Text / Ref. book and Page No
UNIT -1 (INTRODUCTION)	
1	Electrical machine types	R2
2	Magnetic circuits and Inductance	R2
3	Statically and Dynamically induced EMF	R2
4	Torque	R2
5	Hysteresis- Core losses (AV CLASS)	R2
6	AC operation of magnetic circuits.	R2
7-9	Problem	R2
UNIT -2 (TRANSFORMERS)	
1-2	Construction – principle of operation	R2
3-5	equivalent circuit and Losses	R2
6-7	Testing, efficiency and voltage regulation	R2
8	auto transformer (AV CLASS)	R2
9	three phase connections	R2
10	Parallel operation of transformers and Tap changing	R2
11-13	Problem	R2
UNIT -3 (ELECTROMECHANICAL ENERGY CONVERSION)	
1-2	Energy in magnetic systems	R2
3-4	Field energy and Co-energy	R2
5-6	Mechanical force	R2
7-8	Singly excited systems.	R2

9	Multiply excited systems	R2
10-12	Problem	R2

UNIT -4 (BASIC CONCEPTS IN ROTATING MACHINES)

1-3	Generated voltages in ac and dc machines	T1
4-5	MMF of distributed windings	T1
6	Magnetic fields in rotating machines (AV CLASS)	T1
7	Rotating MMF waves	T1
8-9	Torque in ac and dc machines.	T1
10-12	Problem	T1

UNIT -5 (DC MACHINES)

1	Construction	R2
2	EMF & Torque	R2
3	Armature Reaction	R2
4-5	Circuit model and Commutation	R2
6	Methods of Excitation	R2
7	Characteristics of Generators	R2
8	Characteristics of Motors	R2
9-10	Starting and Speed control (AV CLASS)	R2
11	Testing and Efficiency – Parallel operation.	R2
12-14	Problem	R2

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