

# 22EE207 INDUCTION AND SYNCHRONOUS MACHINES

Hours Per Week :

L	T	P	C
3	0	2	4

**PREREQUISITE KNOWLEDGE:** DC Machines.**COURSE DESCRIPTION AND OBJECTIVES:**

- Provide knowledge on construction, operation, types and applications of Induction and synchronous machines.
- Discuss the complete characteristic features of different Induction and synchronous machine and special machines in their field of applications.
- Study of special machines.

**MODULE-1****UNIT-1****12L+0T+2P=14 Hours****INTRODUCTION TO INDUCTION MACHINES:**

Constructional details, Principle of operation, Starting Methods, Applications in real time systems.

**UNIT-2****12L+0T+14P=26 Hours****PERFORMANCE OF INDUCTION MACHINES:**

Torque-slip characteristics, Power flow diagram and relations, Losses and efficiency, Speed control techniques, Equivalent circuit.

**PRACTICES:**

- Separation of no-load losses in three phase induction motor.
- Load test on three-phase squirrel cage induction motor.
- Load test on three-phase slip ring induction motor.
- Determination of performance characteristics of single phase induction motor.

**MODULE-2****UNIT-1****12L+0T+2P=14 Hours****INTRODUCTION TO SYNCHRONOUS MACHINES:**

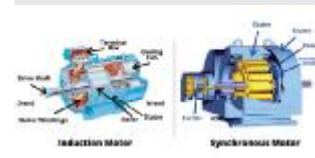
Constructional details, Principle of operation, EMF equation, Prediction of voltage regulation methods, V and inverted V-curves of Synchronous motor, Power output of Synchronous motor &amp; hunting.

**UNIT-2****12L+0T+14P=26 Hours****PARALLEL OPERATION OF SYNCHRONOUS MACHINES:**

Methods of synchronization, Synchronizing power., Effect of change in excitation and prime mover torque, Two reaction theory - direct and quadrature axis synchronous reactance; Slip test.

**PRACTICES:**

- Regulation of a three phase alternator by synchronous impedance method.
- Regulation of a three phase alternator by M.M.F. method.
- Regulation of three phase alternator by Z.P.F. method.



Source: <https://hermitageautomation.com/difference-induction-and-synchronous-motor/>

**SKILLS:**

- ✓ Identify suitable starting method for a 3-phase induction motor based on the application.
- ✓ Suggest a suitable speed control technique for a 3-phase induction motor based on the application.
- ✓ Determine the voltage regulation of alternator at any given load.
- ✓ Choose an appropriate special machine for given application.

- V and Inverted V curves of a three phase synchronous motor.
- Determination of  $X_d$  and  $X_q$  of a salient pole synchronous machine.
- Load Test on three phase alternator.

**COURSE OUTCOMES:**

Upon successful completion of this course, students will have to ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyse speed torque characteristics and speed control of induction motors.	Analyze	1	1, 2, 9, 11
2	Analyse parallel operation of alternators.	Analyze	2	1, 2, 9, 11
3	Evaluate the performance of induction motor.	Evaluate	1	1, 2, 9, 11
4	Evaluate performance characteristics of induction machines.	Evaluate	1	1, 2, 9, 11
5	Obtain V and characteristics of synchronous machine.	Evaluate	2	1, 2, 9, 11

**TEXT BOOKS:**

1. P.S. Bimbira, "Electrical Machinery", 7th edition, Khanna Publishers, 2011.
2. I.J. Nagrath and D.P. Kothari, "Electric Machines", 5th edition, Tata Mc-Graw Hill Publishers, 2017.

**REFERENCE BOOKS:**

1. Charles I Hubert, "Electric Machines (Theory, operation, applications, adjustment and control)", 2nd edition, Pearson India, 2009.
2. P.S.Bimbira, "Generalized Theory of Electrical Machines", 5th edition, Khanna Publications, 2009.