

**SHREE SATHYAM COLLEGE OF ENGINEERING AND  
TECHNOLOGY**

**SUBJECT CODE: EE6504**

**SUBJECT NAME: ELECTRICAL MACHINES – II**

**Regulation: 2013**

**Year and Semester: V**

**OBJECTIVES:**

- To impart knowledge on Construction and performance of salient and non – salient type synchronous generators.
- To impart knowledge on Principle of operation and performance of synchronous motor.
- To impart knowledge on Construction, principle of operation and performance of induction machines.
- To impart knowledge on Starting and speed control of three-phase induction motors.
- To impart knowledge on Construction, principle of operation and performance of single phase induction motors and special machines.

**UNIT I SYNCHRONOUS GENERATOR****9**

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance –Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves

**UNIT II SYNCHRONOUS MOTOR****9**

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves –Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations –damper windings- synchronous condenser.

**UNIT III THREE PHASE INDUCTION MOTOR****9**

Constructional details – Types of rotors – Principle of operation – Slip –cogging and crawling-Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor.

**UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR****9**

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star-delta starters– Speed control – Voltage control, Frequency control and pole changing – Cascaded connection- V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

**UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES****9**

Constructional details of single phase induction motor – Double field revolving theory and operation –Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor-Shaded pole induction motor - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magnetic levitation systems.

**TOTAL (L:45+T:15): 60 PERIODS****OUTCOMES:**

- Ability to model and analyze electrical apparatus and their application to power system

**TEXT BOOKS:**

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D.Umans, „Electric Machinery“, Tata Mc Graw Hill publishing Company Ltd, 2003.
2. D.P. Kothari and I.J. Nagrath, „Electric Machines“, Tata McGraw Hill Publishing Company Ltd, 2002.
3. P.S. Bhimbhra, „Electrical Machinery“, Khanna Publishers, 2003.

**REFERENCES:**

1. M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning LTD., New Delhi, 2009.
2. Charless A. Gross, “Electric /Machines, “CRC Press, 2010.
3. K. Murugesh Kumar, „Electric Machines“, Vikas Publishing House Pvt. Ltd, 2002.
4. Syed A. Nasar, Electric Machines and Power Systems: Volume I, Mcgraw -Hill College; International ed Edition, January 1995.
5. Alexander S. Langsdorf, Theory of Alternating-Current Machinery, Tata McGraw Hill Publications, 2001.

## EE6504 ELECTRICAL MACHINES II

### 1. Aim and Objective of the Subject

#### Objectives:

- To impart knowledge on Principle of operation and performance of synchronous motor.
- To impart knowledge on Construction, principle of operation and performance of induction machines.
- To impart knowledge on Starting and speed control of three-phase induction motors.

### 2. Need and Importance for Study of the Subject:

- To understand the working of synchronous machine and asynchronous machines.
- To achieve speed control of various asynchronous machines.
- To analyze and evaluate the torque equation of synchronous machine and asynchronous machines.

### 3. Course outcomes:

At the end of the semester students will be able to

- Know the operation of alternator and calculate their regulation by different method.
- Start the synchronous motor with different methods.
- Draw the circle diagram for induction motor.
- Know about the starters of induction motor.
- Classify the various special machines.

### 4. Industry Connectivity and Latest Developments

#### Industry Connectivity:

- The following companies (Industries) are connectivity to ELECTRICAL MACHINES:  
Power stations, Wind Mills, Paper Industries.

### 5. Latest Developments:

- Special Electrical Machines were developed to overcome the difficulties of Synchronous and Induction machines..

