

# Industrial AC Machines

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**Maharashtra State Board of Technical Education (MSBTE)**

**Semester V – Electrical Engineering Group (EE/EP/EU)**

Strictly as per new revised 'I' Scheme w.e.f. academic year 2019-2020

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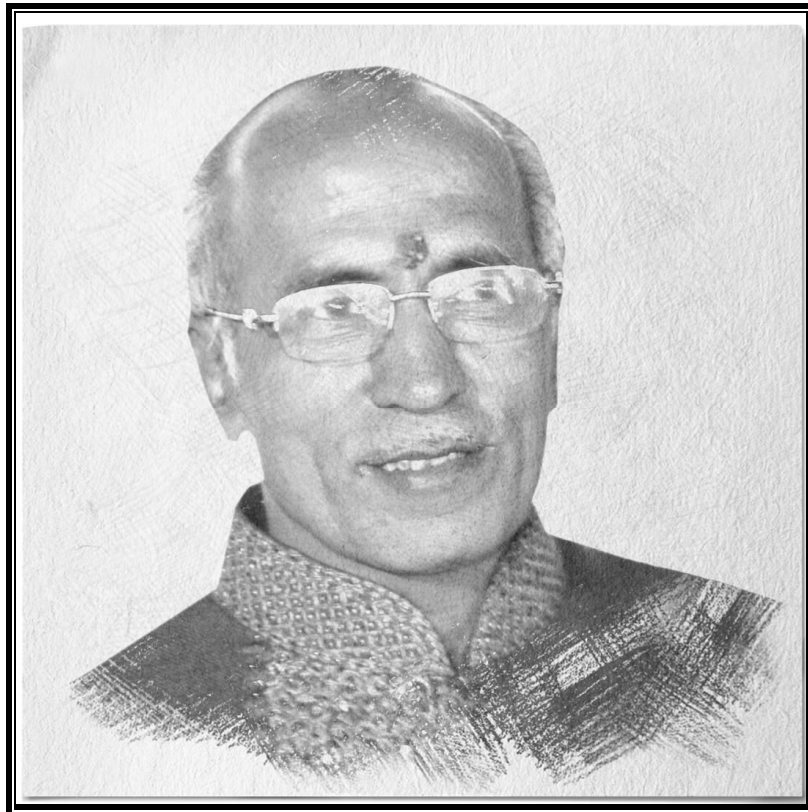
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*We dedicate this Publication soulfully and wholeheartedly,  
in loving memory of our beloved founder director,  
Late Shri. Pradeepji Lalchandji Lunawat,  
who will always be an inspiration, a positive force and strong support  
behind us.*



*“My work is my prayer to God”*

*- Lt. Shri. Pradeepji L. Lunawat*

*Soulful Tribute and Gratitude for all Your  
Sacrifices, Hardwork and 40 years of Strong Vision...*

# Syllabus...

## **Industrial AC Machines : Sem. V (Electrical Engineering Group (MSBTE))**

### **Unit-I**

#### **1. Three Phase Induction Motor :**

Working principle : Production of rotating magnetic field, Synchronous speed, Rotor speed and slip, Constructional details of 3 phase induction motors : Squirrel cage induction motor and slip ring induction motor. Rotor quantities : Frequency, Induced emf, Power factor at starting and running condition, Characteristics of torque versus slip (Speed), Torques : Starting, Full load and maximum with relations among them. Induction motor as a generalized transformer with phasor diagram, Four quadrant operation, Power flow diagram, Starters : Need and types : Stator resistance, Auto transformer, Start delta, Rotor resistance and soft starters, Speed control methods : Stator voltage, Pole changing, Rotor resistance and VVVF. Motor selection for different applications as per the load torque speed requirements, Maintenance of three phase induction motors. **(Refer Chapter 1)**

### **Unit-II**

#### **2. Single Phase Induction Motors :**

Double field revolving theory, Principle of making these motors self start, Construction and working : Resistance start induction run, Capacitor start induction run, Capacitor start capacitor run, Shaded pole, Repulsion type, Series motor, Universal motor, Hysteresis motor. Torque-speed characteristics for all of the above motors, Motor selection for different applications as per the load torque speed requirements, Maintenance of single phase induction motors. **(Refer Chapter 2)**

### **Unit-III**

#### **3. Three Phase Alternators :**

Principle of working, Moving and stationary armatures, Constructional details : Parts and their functions, Rotor Constructions, Windings : Single and double layer, E.M.F. equation of Alternator with numerical by considering short pitch factor and distribution factor. Alternator loading : Factors affecting the terminal voltage of alternator ; Armature resistance and leakage reactance drops, Armature reaction at various power factors and synchronous impedance, voltage regulation ; direct loading and synchronous impedance methods, maintenance of alternators. **(Refer Chapter 3)**

### **Unit-IV**

#### **4. Synchronous Motors :**

Principle of working / Operation, Significance of load angle, Torques : Starting torque, Running torque, Pull in torque, Pull out torque, Synchronous motor on load with constant excitation (numerical), Effect of excitation at constant load (numerical). V-Curves and Inverted V-Curves, Hunting and phase swinging. Methods of starting of synchronous motor, Losses in synchronous motors and efficiency (no numericals), Applications areas. **(Refer Chapter 4)**

**Unit-V**

**5. Fractional Horse Power Motors (FHP) :**

Construction and working : Synchronous Reluctance motor, Switched reluctance motor, BLDC, Permanent magnet synchronous motors, Stepper motors, AC and DC servomotors, Torque speed characteristics of above motors, Applications of above motors.

**(Refer Chapter 5)**



**Unit-I****Chapter 1 : Three Phase Induction Motor 1-1 to 1-74**

**Syllabus :** Working principle : Production of rotating magnetic field, Synchronous speed, Rotor speed and slip. Constructional details of three phase induction motor : Squirrel-cage and slip-ring induction motor, Rotor quantities : Frequency, Induced emf, Power factor at starting and running condition, Characteristics of torque versus slip (speed), Torques : Starting, Full load and maximum with relations among them. Induction motor as a generalized transformer with phasor diagram, Four quadrant operation, Power flow diagram, Starters : Need and types, Stator resistance, Auto transformer, Star-Delta, Rotor resistance and soft starters, Speed control methods : Stator voltage, Pole changing, Rotor resistance and VVVF. Motor selection for different applications as per the load torque speed requirements, Maintenance of three phase induction motors.

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### Unit-III

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**Syllabus :** Principle of working : Moving and stationary armatures, Constructional details : Parts and their functions. Rotor constructions : Windings; Single and double layer. E.M.F. equation of alternator with numerical by considering short pitch factor and distribution factor, Alternator loading : Factors affecting the terminal voltage of alternator, Armature resistance and leakage reactance drops, Armature reaction

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