

**Govt. Polytechnic Hamirpur (H.P.)**  
**Lecture Planning (Theory)**

Branch : Electrical Engg.----- Semester: 4<sup>th</sup>  
 Subject : INDUCTION, SYNCHRONOUS AND SPECIAL ELECTRIC MACHINES Session: Jan-Jun-2026  
 Teacher: Archit Bharti----- Class Room : EBL2


Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Referenc e Resources	Remarks
1.	16	Unit – I 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, 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	R1,R4,R5	
2.	12	Unit – II 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.	R5	
3.	16	Unit– III Three	Principle of working, moving and stationary armatures. Constructional details: parts and their functions, rotor	R4	

		phase Alternators	<p>constructions. Windings: Single and Double layer. E.M.F. equation of an Alternator with numerical by considering short pitch factor and distribution factor.</p> <p>Alternator loading: Factors affecting the terminal voltage of alternator; Armature resistance and leakage reactance drops. Armature reaction at various power factors and synchronous impedance.</p> <p>Voltage regulation: direct loading and synchronous impedance methods.</p>
4.	12	Unit- IV Synchronous motors	<p>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 numerical). Applications areas</p>
5.	8	Unit- V Fractional horse power (FHP) Motors	<p>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.</p>

#### Teaching Resources:

1. P.S. Bimbhra, Electric Machines, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173-294)
2. Mittle, V.N. and Mittle, Arvind., Basic Electrical Engineering, McGraw Hill Education New Delhi, ISBN :9780070593572161
3. Kothari, D. P. and Nagrath, I. J., Electrical Machines, McGraw Hill Education, New Delhi, ISBN:9780070699670
4. Bhattacharya, S. K., Electrical Machines, McGraw Hill Education, New Delhi, ISBN:9789332902855
5. Theraja, B.L., Electrical Technology Vol-II (AC and DC machines), S.Chand and Co. Ltd., New Delhi, ISBN : 9788121924375
6. Sen, S. K., Special Purpose Electrical Machines, Khanna Publishers, New Delhi, ISBN:9788174091529

Signature of Teacher with Date

 27/11/26

Signature of H.O.D.

