

"PVC" NSSK Govt. Polytechnic Bilaspur at Kalol (H.P.)

Lesson Plan (Theory)

Branch : Electrical Engg.

Semester: 4th

Subject : Induction, Synchronous & Special Elect. Machines


Session: Jan 2025 – Jun 2025

Teacher : Sh Ashwani Kumar

Class Room: L-4

Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Reference Resources	Rem.
1	15	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,R2,R3	
2	10	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.	-do-	
3	15	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 an Alternator with numerical by considering short pitch factor and distribution factor. Alternator loading: Factors affecting the terminal voltage of alternator, Armature	-do-	

			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.	
4	10	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 numerical). Applications areas.	-do-
5	6	Fractional horse power (FHP) Motors	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.	-do-


 Signature of Teacher with Date 27/01/25


 Signature of HOD (EE)

Teaching Resources:

- R1. Bhattacharya, S. K., Electrical Machines, McGraw Hill Education, New Delhi.
- R2. P.S. Bimbhra, Electric Machines, Khanna Book Publishing Co., New Delhi.
- R3. <http://www.electrical4u.com>

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Subject : Induction, Synchronous & Special Elect. Machine Lab Session: Jan 2025 – Jun 2025

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Lab: Elect. Machine Lab

Pract. No.	Description of Practical	Reference for Procedure/ Writeup	Likely Dates	Actual Dates	Sign.
1.	Identify the different parts (along with function and materials) for the given single phase and three phase induction motor.	Lab Manual			
2.	Connect and run the three phase squirrel cage induction motors (in both directions) using the DOL, star-delta, auto-transformer starters (any two)	Lab Manual			
3.	Conduct the No-load and Blocked-rotor tests on given 3-ph squirrel cage induction motor and determine the equivalent circuit parameters.	Lab Manual			
4.	Control the speed of the given three phase squirrel cage/slip ring induction motor using the applicable methods: i) auto-transformer, ii) VVVF.	Lab Manual			
5.	Measure the open circuit voltage ratio of the three phase slip ring induction motor.	Lab Manual			
6.	Perform the direct loading test on the given three phase alternator and determine the regulation and efficiency.	Lab Manual			
7.	Determine the regulation and efficiency of the given three phase alternator from OC and SC tests(Synchronous impedance method).	Lab Manual			
8.	Conduct the test on load or no load to plot the 'V' curves and inverted 'V' curves (at no-load) of 3-f synchronous motor.	Lab Manual			
9.	Dismantling and reassembling of single phase motors used for ceiling fans, universal motor for mixer.	Lab Manual			

10	Control the speed and reverse the direction of stepper motor.	Lab Manual			
11	Control the speed and reverse the direction of the AC servo motor.	Lab Manual			
12	Control the speed and reverse the direction of the DC servo motor.	Lab Manual			


27/01/25

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