

**GOVT. POLYTECHNIC KANDHAMAL, (PHULBANI)**

**LESSON PLAN: AC MACHINES AND SPECIAL ELECTRICAL MACHINES**

**4<sup>TH</sup> – SEMESTER, 2026 (S)**

Discipline: <b>Electrical Engineering</b>	Semester: <b>Summer 2026</b>	Name of the teaching faculty: <b>BICHITRANANDA PADHIARY. Lect.I (Elect.)</b>
Subject: <b>AC M/C &amp; SEM/C</b>	No of days/per week class allotted: <b>03</b>	Semester From Date: <b>22.12.2025</b> To Date: <b>18.04.2026</b> No of weeks: <b>16</b>
Week:	Class day:	Theory/practical topics:
<b>1<sup>ST</sup></b>	<b>1<sup>ST</sup></b>	<b>Unit I (Three Phase Induction Motor)</b> Working principle: production of rotating magnetic field ,Synchronous speed, rotor speed and slip
	<b>2<sup>ND</sup></b>	Constructional details of 3 phase induction motors: Squirrel cage induction motor and Slip ring induction motor
	<b>3<sup>RD</sup></b>	Rotor quantities: frequency, induced emf, power factor at starting and running condition
<b>2<sup>ND</sup></b>	<b>1<sup>ST</sup></b>	Characteristics of torque versus slip (speed), Torques: starting, full load and maximum with relations among them(numerical)
	<b>2<sup>ND</sup></b>	Induction motor as a generalized transformer with phasor diagram
	<b>3<sup>RD</sup></b>	Four quadrant operation, Power flow diagram(numericals)
<b>3<sup>RD</sup></b>	<b>1<sup>ST</sup></b>	Starters: need and types; stator resistance, auto transformer, star delta, rotor resistance and soft starters
	<b>2<sup>ND</sup></b>	Speed control methods: stator voltage, pole changing, rotor resistance and VVVF
	<b>3<sup>RD</sup></b>	Motor selection for different applications as per the load torque speed requirements Maintenance of three phase induction motors
<b>4<sup>TH</sup></b>	<b>1<sup>ST</sup></b>	Revision class on three phase induction motor
	<b>2<sup>ND</sup></b>	<b>Unit II(Single Phase Induction Motor)</b> Double field revolving theory.
	<b>3<sup>RD</sup></b>	Principle of making single phase induction motors self-start
<b>5<sup>TH</sup></b>	<b>1<sup>ST</sup></b>	Construction and working of single phase induction motors
	<b>2<sup>ND</sup></b>	Resistance start induction run , Capacitor start induction run, Capacitor start capacitor run ,
	<b>3<sup>RD</sup></b>	Shaded pole, Repulsion type , Series motor
<b>6<sup>TH</sup></b>	<b>1<sup>ST</sup></b>	Universal motor , Hysteresis motor
	<b>2<sup>ND</sup></b>	Torque-speed characteristics for all of the above motors
	<b>3<sup>RD</sup></b>	Motor selection for different applications as per the load torque- speed requirements, Maintenance of single phase induction motors



7 <sup>TH</sup>	1 <sup>ST</sup>	<b>CLASS TEST-I</b>
	2 <sup>ND</sup>	<b>Unit III(Three Phase Alternators)</b> Principle of working, moving and stationary armatures
	3 <sup>RD</sup>	Constructional details: parts and their functions
8 <sup>TH</sup>	1 <sup>ST</sup>	Rotor constructions , Windings: Single and Double layer
	2 <sup>ND</sup>	E.M.F. equation of an Alternator with numerical by considering short pitch factor and distribution factor
	3 <sup>RD</sup>	Simple numerical.
9 <sup>TH</sup>	1 <sup>ST</sup>	Alternator loading, Factors affecting the terminal voltage of alternator
	2 <sup>ND</sup>	Armature resistance and leakage reactance drops, Armature reaction at various power factors and synchronous impedance ,
	3 <sup>RD</sup>	Voltage regulation: direct loading and synchronous impedance methods, Maintenance of alternators
10 <sup>TH</sup>	1 <sup>ST</sup>	Simple numerical and revision on three phase Alternators
	2 <sup>ND</sup>	<b>Unit-IV(Synchronous Motors)</b> Principle of working /operation, significance of load angle
	3 <sup>RD</sup>	Torques: starting torque, running torque, pull in torque, pull out torque
11 <sup>TH</sup>	1 <sup>ST</sup>	Synchronous motor on load with constant excitation (numerical), effect of excitation at constant load (numerical).
	2 <sup>ND</sup>	Curves and Inverted V-Curves.
	3 <sup>RD</sup>	Hunting and Phase swinging.
12 <sup>TH</sup>	1 <sup>ST</sup>	Methods of Starting of Synchronous Motor
	2 <sup>ND</sup>	Losses in synchronous motors and efficiency (no numerical). Applications areas
	3 <sup>RD</sup>	Simple numerical
13 <sup>TH</sup>	1 <sup>ST</sup>	Revision on Synchronous Motor,
	2 <sup>ND</sup>	<b>Unit-V(Fractional Horse Power(FHP) Motors)</b> Construction and working 1. Synchronous Reluctance Motor ,
	3 <sup>RD</sup>	2. Switched Reluctance Motor
14 <sup>TH</sup>	1 <sup>ST</sup>	3. BLDC
	2 <sup>ND</sup>	4. Permanent Magnet Synchronous Motors
	3 <sup>RD</sup>	5. Stepper motors,
15 <sup>TH</sup>	1 <sup>ST</sup>	6. AC and DC servomotors
	2 <sup>ND</sup>	Torque speed characteristics of above motors
	3 <sup>RD</sup>	Applications of above motors

16 <sup>TH</sup>	1 <sup>ST</sup>	CLASS TEST-II
	2 <sup>ND</sup>	Previous semester question discussion
	3 <sup>RD</sup>	Previous semester question discussion

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