

## ACADEMIC LESSON PLAN OF WINTER 2023 (2023-24)

<b>Discipline:</b> ELECTRICAL	<b>Semester:</b> 5 <sup>th</sup> Sem.	Name of the Teaching Faculty: J BINOD KUMAR
<b>Subject:</b> ENERGY CONVERSION-II	<b>No. of days/per week class allotted:</b> 4p/week	Semester From: 01/08/2023 TO 30/11/2023 No. of weeks: 15 weeks
<b>Week</b>	<b>Class Day</b>	<b>Theory Topics</b>
1 <sup>st</sup>	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>	<b>1. ALTERNATOR:</b> Introduction, Constructional features, Advantages of stationary armature Types of alternator, Basic working principle of alternator and the relation between speed and frequency. Terminology in armature winding and expressions for winding factors (Pitch factor, Distribution factor). Explain harmonics, its causes and impact on winding factor.
2 <sup>nd</sup>	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>	E.M.F equation of alternator Derivation and numerical problems. Numerical problems related to E.M.F. equation of alternator Armature reaction and its effect on emf at different power factor of load. Vector diagram of loaded alternator and Numerical problems
3 <sup>rd</sup>	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>	Numerical Problems related to Vector Diagram of alternator Testing of alternator, Open circuit test and short circuit test. Determination of voltage regulation of Alternator by direct loading and synchronous impedance method and numerical problems numerical problems related to voltage regulation
4 <sup>th</sup>	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup>	Parallel operation of alternator using synchro-scope and dark & Bright lamp method. Distribution of load by parallel connected alternators.
5 <sup>th</sup>	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>	<b>2. SYNCHRONOUS MOTOR:</b> Constructional feature of Synchronous Motor, Principle of operation, concept of load angle Derivation of torque, power developed, power flow in synchronous motor Effect of varying load with constant excitation. Effect of varying excitation with constant load. Different types of torque in synchronous motor Effect of excitation on Armature current and power factor ( V – curve and inverted V – curve) Power angle characteristics of cylindrical rotor motor. Hunting in Synchronous Motor, its causes and effects Function of Damper Bars in synchronous motor and generator. Methods of starting of Synchronous motor.
6 <sup>th</sup>	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>	State application of synchronous motor. <b>3. THREE PHASE INDUCTION MOTOR:</b> Production of rotating magnetic field. Constructional feature of Squirrel cage and Slip ring induction motors.
7 <sup>th</sup>	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>	Working principles of operation of 3-phase Induction motor. Slip, slip speed and the relation of slip with rotor quantities. Derivation of expression for torque during starting condition and maximum torque. Derivation of expression for torque during running condition and maximum torque Torque-slip characteristics and numerical problems
8 <sup>th</sup>	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>	Derivation of relation between full load torque and starting torque etc. and numerical problems relations between Rotor Copper loss, Rotor output and Gross Torque and relationship of slip with rotor copper loss and numerical problems Numerical problems related to torque and losses
9 <sup>th</sup>	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>	Methods of starting and different types of starters used for three phase Induction motor speed control by Voltage Control, Rotor resistance control, Pole changing, frequency control methods. Plugging as applicable to three phase induction motor. Different types of motor enclosures.
10 <sup>th</sup>	1 <sup>st</sup> 2 <sup>nd</sup>	principle of Induction Generator and its applications. <b>4. SINGLE PHASE INDUCTION MOTOR:</b> Introduction and Ferraris's principle. double revolving field theory to analyse starting torque of 1-phase induction motor.

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28.07.23

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	3 <sup>rd</sup>	Cross-field theory to analyse starting torque of 1-phase induction motor.
	4 <sup>th</sup>	Split phase motor.
11 <sup>th</sup>	1 <sup>st</sup>	Capacitor Start motor
	2 <sup>nd</sup>	Capacitor start, capacitor run motor
	3 <sup>rd</sup>	Permanent capacitor type motor
	4 <sup>th</sup>	Shaded pole motor
12 <sup>th</sup>	1 <sup>st</sup>	<b>5. COMMUTATOR MOTORS:</b> Construction, working principle of single phase series motor.
	2 <sup>nd</sup>	running characteristic and application of single phase series motor.
	3 <sup>rd</sup>	Construction of Universal motors.
	4 <sup>th</sup>	working principle and application of Universal motors.
13 <sup>th</sup>	1 <sup>st</sup>	Working principle of Repulsion start Motor
	2 <sup>nd</sup>	Working principle of Repulsion start Induction run motor, Repulsion Induction motor.
	3 <sup>rd</sup>	<b>6. SPECIAL ELECTRICAL MACHINE:</b> Principle of Stepper motor, Classification of Stepper motor.
	4 <sup>th</sup>	Principle of variable reluctance stepper motor.
14 <sup>th</sup>	1 <sup>st</sup>	Principle of Permanent magnet stepper motor.
	2 <sup>nd</sup>	Principle of hybrid stepper motor.
	3 <sup>rd</sup>	Applications of Stepper motor.
	4 <sup>th</sup>	<b>7. THREE PHASE TRANSFORMERS:</b> Grouping of winding, star-star, delta-delta
15 <sup>th</sup>	1 <sup>st</sup>	Star-delta, delta-star
	2 <sup>nd</sup>	parallel operation of the three phase transformers necessity and conditions
	3 <sup>rd</sup>	tap changer (On/Off load tap changing)
	4 <sup>th</sup>	Maintenance Schedule of Power Transformers

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Signature of Teaching Faculty

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Mr. Veer (Elect)