**SUNDARGARH ENGINEERING SCHOOL, KIREI**

**LESSON PLAN**

**Subject : ENERGY CONVERSION -II**

**Discipline : ELECTRICAL ENGINEERING**

**Faculty : ASWINI KUMAR PATEL**

**Semester : 5TH**

| Week | Weekly classes | Theory Topics |
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| 1st | 1st | **1. ALTERNATOR** 1.1. Types of alternator and their constructional features. 1.2. Basic working |
| | 2nd | 1.3 Terminology in armature winding and expressions for winding factors (Pitch factor, Distribution factor). 1.4. Explain harmonics, its causes and impact on winding factor |
| | 3rd | 1.5. E.M.F equation of alternator. (Solve numerical problems). |
| | 4th | 1.6. Explain Armature reaction and its effect on emf at different power factor of load. |
| 2nd | 1st | The vector diagram of loaded alternator. (Solve numerical problems) 1.8. Testing of alternator (Solve numerical problems) 1.8.1. Open circuit test. 1.8.2. Short circuit test. |
| | 2nd | Determination of voltage regulation of Alternator by direct loading and synchronous impedance method. (Solve numerical problems) |
| | 3rd | 1.10. Parallel operation of alternator using synchro-scope and dark & bright lamp method. |
| | 4th | 1.11. Explain distribution of load by parallel connected alternators. |
| 3rd | 1st | **Chapter # 2 SYNCHRONOUS MOTOR:** 2.1. Constructional feature of Synchronous Motor. 2.2. Principles of operation, concept of load angle |
| | 2nd | 2.3. Derive torque, power developed. 2.4. Effect of varying load with constant excitation. |
| | 3rd | 2.5. Effect of varying excitation with constant load. |
| | 4th | 2.6. Power angle characteristics of cylindrical rotor motor. |
| 4th | 1st | 2.7. Explain effect of excitation on Armature current and power factor. |
| | 2nd | 2.8. Hunting in Synchronous Motor. |
| | 3rd | 2.9. Function of Damper Bars in synchronous motor and generator. |

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| | 4th | Numerical problem discussion. |
| 5th | 1st | 2.10. Describe method of starting of Synchronous motor |
| | 2nd | 2.11 State application of synchronous motor. |
| | 3rd | Numerical problem solved. |
| | 4th | Numerical problem solved. |
| 6th | 1st | **Chapter # 3 THREE PHASE INDUCTION MOTOR**<br>3.1. Production of rotating magnetic field. 3.2. Constructional feature of Squirrel cage and Slip ring induction motors. 3.3. Working principles of operation of 3-phase Induction motor |
| | 2nd | 3.4. Define slip speed, slip and establish the relation of slip with rotor quantities. |
| | 3rd | 3.5. Derive expression for torque during starting and running conditions and derive conditions for maximum torque. (solve numerical problems) |
| | 4th | 3.6. Torque-slip characteristics |
| 7th | 1st | 3.7. Derive relation between full load torque and starting torque etc. (solve numerical problems) |
| | 2nd | 3.8. Establish the relations between Rotor Copper loss, Rotor output and Gross Torque and relationship of slip with rotor copper loss. (solve numerical problems) |
| | 3rd | 3.9. Methods of starting and different types of starters used for three phase Induction motor. |
| | 4th | 3.10. Explain speed control by Voltage Control, Rotor resistance control, Pole changing, frequency control methods |
| 8th | 1st | 3.11. Plugging as applicable to three phase induction motor |
| | 2nd | 3.12. Describe different types of motor enclosures |
| | 3rd | 3.13. Explain principle of Induction Generator and state its applications. |
| | 4th | Numerical problem solved |
| 9th | 1st | **Chapter # 4 SINGLE PHASE INDUCTION MOTOR**<br>4.1. Explain Ferrari's principle. |
| | 2nd | 4.2. Explain double revolving field theory and Cross-field theory to analyze starting torque of 1-phase induction motor. |
| | 3rd | 4.3. Explain Working principle, Torque speed characteristics, performance characteristics and application of following single phase motors. |

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| | 4th | 4.3.1. Split phase motor. 4.3.2. Capacitor Start motor. |
| 10th | 1st | 4.3.3. Capacitor start, capacitor run motor. 4.3.4. Permanent capacitor type motor. |
| | 2nd | 4.3.5. Shaded pole motor. |
| | 3rd | 4.4. Explain the method to change the direction of rotation of above motors. |
| | 4th | **Chapter # 5 COMMUTATOR MOTORS**<br>5.1 Construction, working principle, running characteristic and application of single phase series motor. |
| 11th | 1st | 5.2. Construction, working principle and application of Universal motors. |
| | 2nd | 5.3. Working principle of Repulsion start Motor, Repulsion start Induction run motor, Repulsion Induction motor. |
| | 3rd | Chapter # 6 SPECIAL ELECTRICAL MACHINE:<br>6.1. Principle of Stepper motor |
| | 4th | 6.2. Classification of Stepper motor. |
| 12th | 1st | 6.3. Principle of variable reluctant stepper motor. |
| | 2nd | 6.4. Principle of Permanent magnet stepper motor. |
| | 3rd | 6.5. Principle of hybrid stepper motor. |
| | 4th | 6.6. Applications of Stepper motor. |
| 13th | 1st | Question and numerical problem solved. |
| | 2nd<br>3rd | **7. THREE PHASE TRANSFORMERS**<br>7.1. Explain Grouping of winding, Advantages. |
| | 4th | 7.2. Explain parallel operation of the three phase transformers |
| 14th | 1st | 7.3. Explain tap changer (On/Off load tap changing |
| | 2nd | 7.4. Maintenance Schedule of Power Transformers. |
| | 3rd | Numerical problem solved. |
| | 4th | Numerical problem solved. |

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