**Course Objectives:**  
To impart knowledge on constructional details, operating principle and performance of 3-phase Synchronous Machines and Fractional Kilowatt Motors.

1. **Three Phase Synchronous Generator(8 hours)**
   1. Constructional Details, Armature Windings, Types of Rotor, Exciter
   2. Working Principle, Rotating Magnetic Field
   3. EMF equation, distribution factor, pitch factor
   4. Armature Reaction and its effects
   5. Alternator with load and its phasor diagram
   6. Voltage Regulations
   7. Parallel Operation and Synchronization
   8. Operation on infinite bus

1. **Three Phase Synchronous Motor(7 hours)**
   1. Principle of operation
   2. Starting methods
   3. No load and Load operation, Phasor Diagram
   4. Effect of Excitation and power factor control, V and Inverted V Curves
   5. Hunting
   6. Power angle Characteristics of Cylindrical Rotor Machine
   7. Two reaction Model of Salient pole machine
   8. Power Angle Characteristics of Salient Pole Machine

1. **Fractional Kilowatt Motors(12 hours)**
   1. Single phase Induction Motors: Construction and Characteristics
   2. Double Field Revolving Theory
   3. Split phase Induction Motor
      1. Capacitor start motor
      2. Capacitors start and run motor
      3. Shaded pole motor
      4. Reluctance start motor
   4. Single phase Synchronous Motor
      1. Reluctance motor
      2. Hysteresis motor
   5. Universal motors
   6. Special Purpose Machines: Stepper motor, Schrage motor and Servo motor

**Practical:**

1. To study No-load characteristics of a 3-phase synchronous generator
2. To study load characteristics of synchronous generator with (a) resistive load (b) inductive load and (c) capacitive load
3. To study the effect of excitation on performance of a synchronous motor and to plot V- curve
4. To study the effect of a capacitor on the starting and running of a single-phaseinduction motor
5. To study the operating characteristics of universal motors

**References:**

1. I.J. Nagrath&D.P.Kothari,” Electrical Machines”, Tata McGraw Hill
2. S. K. Bhattacharya, “Electrical Machines”, Tata McGraw Hill
3. Husain Ashfaq ,” Electrical Machines”, DhanpatRai& Sons
4. A.E. Fitzgerald, C.KingsleyJr and Stephen D. Umans,”Electric Machinery”, Tata McGraw Hill
5. P. S. Bhimbra, “Electrical Machines”’ Khanna Publishers
6. Irving L.Kosow, “Electric Machine and Tranformers”, Prentice Hall of India.
7. M.G. Say, “The Performance and Design of AC machines”, Pit man & Sons.
8. Bhag S. Guru and Huseyin R. Hizirogulu, “Electric Machinery and Transformers” OxfordUniversity Press, 2001.

**Evaluation Scheme**  
The questions will cover all the chapters of the syllabus. The evaluation scheme will be as indicates in the table below.

|  |  |  |
| --- | --- | --- |
| **Chapter** | **Hours** | **Marks Distribution\*** |
| 1 | 8 | 14 |
| 2 | 7 | 12 |
| 3 | 12 | 14 |
| Total | 27 | 40 |

**\*Note: There may be a minor deviation in the marks distribution.**