



## **C.U.SHAH UNIVERSITY**

**FACULTY OF:-**Technology & Engineering  
**DEPARTMENT OF:-**Electrical Engineering  
**BRANCH:** Electrical Engineering  
**SEMESTER: -** IV  
**COURSE:-** B.Tech  
**CODE: -** 4TE04EMC1  
**NAME –** Electrical Machine-II

### **TEACHING & EVALUATION SCHEME**

| Subject Code | Name of the Subject   | Teaching Scheme (Hours) |    |    |       | Credits | Evaluation Scheme |     |                 |     |                   |    |            |       |
|--------------|-----------------------|-------------------------|----|----|-------|---------|-------------------|-----|-----------------|-----|-------------------|----|------------|-------|
|              |                       | Th                      | Tu | Pr | Total |         | Theory            |     |                 |     | Practical (Marks) |    |            | Total |
|              |                       |                         |    |    |       |         | Sessional Exam    |     | University Exam |     | Internal          |    | University |       |
|              |                       |                         |    |    |       |         | Marks             | Hrs | Marks           | Hrs | Pr/Viva           | TW | Pr         |       |
| 4TE04EMC1    | Electrical Machine-II | 4                       | 0  | 2  | 6     | 5       | 30                | 1.5 | 70              | 3   | 30                | 20 | ---        | 150   |

#### **Objectives**

- To expose the students to the concepts of various types of Electrical Machines and applications of Electrical Machines.

#### **Prerequisites**

- Basic of Electrical Engineering
- Fundamentals of Electrical Machines
- Concepts of Electromagnetism
- Concepts of Integration and Differentiation.

#### **Course Outline**

| Sr. No. | Course Contents                                                                                                                                                                                                                                                                                                                                                                                          | Hours |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1       | <b>Poly Phase Transformer:</b><br>Principle, construction, Polarity, Star/star, Star/delta, Delta/delta, delta/zigzag, terminal marking, Nomenclature, Vector diagram, Phase groups, Parallel operation, Scott connection, V-V connections tertiary winding, Testing of transformers, Sumpner's test - efficiency - transients in transformers - voltage regulation - off load and on load tap changers. | 08    |
| 2       | <b>Poly phase Induction Motor:</b><br>Introduction, No-load & blocked rotor test, equivalent circuit, Phasor diagram, Circle diagram, Efficiency and slip scale with the help of circle diagram, Analogy of an I.M. to a transformer, Effect of rotor resistance on performance of I.M., Double cage squirrel cage IM and its equivalent circuit.                                                        | 16    |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2 | Starters of I.M Principles & Methods of speed control of 3- phase I.M. , Electrical transients in induction machine, Magnetic levitations, Principle, advantages & application of linear induction motor, Effect of harmonics, Harmonic torques, Cogging & Crawling, effect of unbalance voltages & frequency variation on operation of I.M.                                                                    |    |
| 3 | <b>Single Phase Induction motor:</b><br>Types of single phase motor, revolving field theory, starting and running performance of single phase IM, Split Phase Motors, Capacitor Type Motor, Shaded Pole Induction Motor, Self Starting Synchronous Reluctance Motor, Hysteresis Motor, AC series Motor, Universal Motor, Speed Control of Universal Motors, Equivalent circuit of single phase Induction Motor. | 10 |
| 4 | <b>Alternator:</b><br>Basic Principle, Detail of construction, Short pitch winding, Spread Factor Equation of Induce e.m.f, alternator on load, Voltage regulation, Methods of voltage regulation, Parallel operation of alternators.                                                                                                                                                                           | 10 |
| 5 | <b>Synchronous Motor</b><br>Construction, Principle of Operation, Starting of synchronous motors, Motor on load with constant excitation and different excitation, Equivalent circuit, Power developed by a synchronous motor, Effect of Excitation on Armature Current and Power Factor, Construction of V curves, Speed Control of Synchronous Motor, Synchronous motor application.                          | 08 |

### Learning Outcomes

- Constructional details, principle of operation, Performance, starters and speed control of Poly phase transformer.
- Constructional details, principle of operation of Alternator.
- Constructional details, principle of operation of Synchronous motor.

### Books Recommended

1. Electrical Technology Vol II, B. L. Theraja. S chand publication.
2. Electrical Machines, by Nagarath & Kothari Tata Macgraw hill Pub.
3. Electrical Machines by J. B. Gupta, ( S.K.Kataria & Sons).
4. Electrical Machines by P S Bhimbra, Khanna Pub.
5. Performance and Design of A.C. machines by M. G. Say,CBS pub.
6. Electrical machine Drives and Power System by Wildi ,6th Edition, Pearson Publications.