



## C.U.SHAH UNIVERSITY – Wadhwan City

**FACULTY OF:** -Technology and Engineering (Diploma Engineering)

**DEPARTMENT OF:** -Electrical Engineering

**SEMESTER:** - III

**CODE:** -2TE03EMC1

**NAME –** Electrical Machine-I (EMC)

### Teaching & Evaluation Scheme:-

| Subject Code | Subject Name               | Teaching Scheme (Hours) |    |    |       | Credits | Evaluation Scheme |       |                 |       |                   |    |            |             |
|--------------|----------------------------|-------------------------|----|----|-------|---------|-------------------|-------|-----------------|-------|-------------------|----|------------|-------------|
|              |                            | Th                      | Tu | Pr | Total |         | Theory            |       |                 |       | Practical (Marks) |    |            | Total Marks |
|              |                            |                         |    |    |       |         | Sessional Exam    |       | University Exam |       | Internal          |    | University |             |
|              |                            |                         |    |    |       |         | Marks             | Hours | Marks           | Hours | Pr                | TW | Pr         |             |
| 2TE03EMC1    | Electrical Machine I (EMC) | 4                       | 0  | 4  | 8     | 6       | 30                | 1.5   | 70              | 3     | 30                | 20 | -----      | 150         |

### Objectives:-

- This course deals with single phase transformer and DC Machines which are widely used in power systems, industries and commercial applications.
- This course will enable the students to develop skills to select, install, operate, and maintain various types of DC machines and transformers.

**Prerequisites:** - Basic Knowledge of Electrical Circuit & Mathematics & Importance of Electrical Machines.

### Course Outlines:-

| Sr. No. | Course Contents   | No Of Hours |
|---------|---|-------------|
| 1       | <b>D. C. Generator:-</b><br>Working Principle, General Features & Construction, Simple Lap and Wave Winding of Armature and their Comparison, Ratings of D.C. Machines, EMF Equation, Types of D.C. Generator, Power Flow in D.C. Generator, Losses and Efficiency, Elementary Treatment of Armature Reaction and Remedies, Commutation, Methods of Improving Commutation, Performance Characteristics of D.C. Generator.   | 18          |
| 2       | <b>D. C. Motor:-</b><br>Working Principle, Understanding of Motoring Action Compared to the Generating Action, Concept of Back EMF, Types of D.C. Motors, Voltage Equations, Condition of Maximum Power, Torque Equation, Speed Regulation, Performance Characteristics of D.C. Motors, Necessity of Starter, Starting of D.C. Motors, Methods of Speed Control, Application of D.C. Motors, Testing of D.C. Machine: Brake Test, Swinburn's Test, Hopkinson's Test, Field test   | 10          |
| 3       | <b>Single Phase Transformer:-</b><br>Working Principle and Constructional Details, Ideal Transformer, EMF Equation, No-Load and Full Load Operation (With Vector Diagram), Equivalent Circuit, Voltage Regulation, Test on Transformer: O.C Test, S.C. Test and Sumpner (Back To Back) Test, Condition For Maximum Efficiency and Concept of All Day Efficiency, Auto Transformer, Saving of Copper, Conversion of Two Winding Transformer to Auto Transformer, Parallel Operation of Single Phase Transformer, Losses in transformer | 16          |

|   |  |    |
|---|--|----|
| 4 | <b>Poly Phase Transformer</b><br>Three Phase Transformer Connections, Comparison of Three Phase Transformer With Bank of 3 Single Phase Transformers, Scott Connection, Condition For Parallel Operation In Three Phase Transformer, Parallel Operation of Three Phase Transformers, Methods of Cooling , Accessories Used With Power Transformer, Classification of Insulating Materials Based on Temperature Rating. | 10 |
|---|--|----|

#### List of Experiments:-

- Identify various parts of DC machine
- Identify various parts of Single phase Transformer
- Test the performance of DC compound machine
- Maintain constant voltage of DC generator at different load conditions.
- Test the performance of a separately excited DC shunt generator
- Test the performance of DC series generator
- Test DC compound generator for external and internal load characteristic
- Test Magnetization characteristic of separately excited D.C. Generator
- Connect three point and four point starters for DC motor.
- Control the speed of DC shunt motor by armature and field control.
- Control the speed of DC series motor.
- Break test on D.C. shunt motor & determine the efficiency.
- Perform Swinburne's test of DC machine.
- Perform Load test on single phase transformer.
- Perform OC and SC test of single phase transformer.
- Perform polarity test on single phase transformer.
- Operate two single phase transformers in parallel having i) Equal impedances ii) Different impedances
- Perform Sumpner's test on single phase transformer.

#### Learning Outcomes:-

- Application & Importance of Electrical Machines.
- Various Testing Method of Electrical Machines.
- Calculation of Different Losses And Efficiency of Machines
- Knowledge of Different Electrical Machine.
- Knowledge of Protective Equipments & Safety Norms.

#### Books Recommended:-

- Electrical Technology **J.B.Gupta** ,S.K.Katariya & Sons
- A Text Book of Electrical Technology, **B.L.Theraja & A.K.Theraja**, S.Chand & Company Ltd.
- A Hand Book of Electrical Engineering, **S.L.Bhatiya**, Khanna Publication