



C.U.SHAH UNIVERSITY

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: - Electrical Engineering
BRANCH: Electrical & Electronics Engineering
SEMESTER: - III
COURSE:- B.Tech
CODE: - 4TE03EMC1
NAME – Electrical Machine-I

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	
4TE03EMC1	Electrical Machine-I	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
- Concepts of Electromagnetism
- Concepts of Integration and Differentiation.

Course Outline

Sr. No.	Course Contents	Hours
1	D.C Generator: Generator Principle, Simple loop generator, Practical generator, Yoke-pole Cores and Poles Shoes-Pole Coils- Types of D.C. Armature Winding-Armature winding terminology, dummy coils, Brushes and Bearing, types of generators, E.M.F. equation, Iron Loss in armature, Total Losses in DC generator Power Stages, Condition for maximum efficiency, Armature Reaction and Commutation, Methods of Improving Commutation, Generator Characteristics, voltage build up process, critical resistance and speed, No load & load characteristics. Performance of shunt, series and compound generators, Uses of DC Generators.	16

2	D.C Motor: Motor Principle, Significance of back e.m.f, Voltage Equation, Condition of Maximum Power, Torque, Armature Torque of a Motor, Shaft torque, Speed of a d.c. motor, Speed regulation torque and speed of a d.c. motor, Motor Characteristics. Necessity of starter, Three point & four point starter. Introduction to soft starter. Torque-speed characteristics of shunt, series & compound motors, Speed control: Basic concept of Static speed control of DC machines, Ward Leonard method. Losses & efficiency in d.c. machines by direct load test and Swinburne's test.	14
3	Single Phase Transformer: Working Principle of single-phase transformer, Transformer Construction, Core type and Shell type transformer, E.M.F equation, operation at no load and on load, vector diagram, equivalent circuit, losses, efficiency and regulation, Determination of regulation and efficiency by direct load test and indirect test methods, parallel operation, auto transformer, Transformer Losses, condition for maximum efficiency, all day efficiency.	12
4	Three Phase Induction Motor : Classification of a.c. motor, General Principle, Construction, Squirrel cage-Phase wound rotor, Production of rotating field, Relation between torque and rotor power factor, Synchronous Speed, speed of rotor field, slip, Various methods of measurement of slip, starting & running torque, torque-slip characteristics, maximum torque, effect of change in voltage & frequency on torque, speed & slip.	10

Learning Outcomes

- Constructional details, Principle of Operation, Performance, Starters and Speed Control of DC Machines.
- Constructional details, Principle of Operation of Transformer.
- Constructional details, Principle of Operation of Induction Motor.

Books Recommended

1. Electrical Technology Vol II, B. L. Theraja, S. Chand Publication
2. Performance and Design of A.C. machines by M. G. Say
3. Electrical Machines by P. S. Bhimbra
4. Electrical Machines by J. B. Gupta, Kataria Publications
5. Electrical Machines by Samarjit Singh – Pearson Education
6. Electrical Machines. By Nagarath & Kothari, TMH Publications