



C.U.SHAH UNIVERSITY

FACULTY OF: - Technology & Engineering

DEPARTMENT OF: -Electrical Engineering

BRANCH: Electrical Engineering

SEMESTER: - V

COURSE:- B.Tech

CODE: - 4TE05EMC1

NAME – Electrical Machine III

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 | | |
| 4TE05EMC1 | Electrical Machine-III | 4 | 0 | 2 | 6 | 5 | 30 | 1.5 | 70 | 3 | -- | 20 | 30 | 150 | |

OBJECTIVES

1. To introduce the students to the concepts of various Electrical advance machines Namely Synchronous machine, Sage Machine, Permanent Brushless motor, modelling and mathematic modal of advance machine and performance of system.
2. To study design and implementation of modelling circuits using Advance machine.

PREREQUISITES

1. Basics and fundamental electrical advance and modern machine and power analysis.

COURSE OUTLINES

| Sr. No. | Course Contents | Hours |
|---------|--|-------|
| 1 | Testing of DC machine: Introduction DC Machine, Principle, construction, merit and demerit DC machine and DC Servo motors, PMBLDC motors, Permanent Magnet Machines, Hopkinson test, Field Test, Separation of losses, Brake test, | 12 |
| 2 | Synchronous Machines: Introduction, generated emf, Harmonics in voltage waveforms, MMF of distributed windings, rotating magnetic field, Torque, Operations, Machine efficiency, Armature reaction and it's compensation, Short circuit ratio, Effect of increase in excitation, Effect of change in torque and speed, Determination of Synchronous reactance, regulation by ZPF method, AIEE methods, | 14 |

| | | |
|---|---|----|
| | Synchronizing & load shadding between two machines Operating characteristics, Load angle and Power flow equations, Capability curves, Two reaction model of Salient pole machines, Parallel operations, Load sharing between generators, Effect of unequal voltages & percentage impedance, Governor characteristics, Hunting, Short circuit transients, single phase generators, Slip test for measurement of X_d and X_q , Sudden short circuit of Synchronous machine. | |
| 3 | Testing of Synchronous Machine : Methods of starting of synchronous motors, Different torques in Synchronous motor, Stability, Synchronous condenser, Synchronous phase modifiers, V-curves and O-curves of Synchronous motors, hunting of synchronous machines and its prevention. | 14 |
| 4 | Special Machines: Special synchronous motors: Hysteresis & Reluctance motor. Miniature motors, Automobile electric systems. Induction Regulator, Inverted Induction machine, Boosters & Balancers, AC & Permanent Magnet Materials : Characteristics, B-H loop and demagnetization characteristics, Residual flux density, Coercivity, Concepts of Maximum energy product and its unit MGO (Mega Gauss Orsted), Recoil line, Minor loop, temperature effects. Applications of PM materials. Stepper Motor, General construction, working and applications of following PM machines:, PM synchronous motors, Axial flux PM machines and Doubly salient PM machines. Switched Reluctance Motor: General construction, working and applications of SRM | 14 |

LEARNING OUTCOMES

After the completion of this course the students would be able to:

1. Design basic the electrical advance machines.
2. Understand basic properties and testing of advance electrical machine and special machines.
3. Understand performance of special machines.

BOOKS RECOMMENDED

1. Electrical Machines by P S Bhimbra
2. Electrical Machines by J. B. Gupta
3. Electrical Technology Vol II. B. L. Theraja
4. Electrical Machines. By Nagarath & Kothari
5. Performance and Design of A.C. machines by M. G. Say
6. Electrical Machines By Mukharji & Chakravarthy