



# 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

- 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.
- To study design and implementation of modelling circuits using Advance machine.

### PREREQUISITES

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

### COURSE OUTLINES

Sr. No.	Course Contents	Hours
1	<b>Testing of DC machine:</b> 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	<b>Synchronous Machines:</b> 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	<b>Testing of Synchronous Machine :</b> 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	<b>Special Machines:</b> 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