



C. U. SHAH UNIVERSITY
Wadhwan City

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: -Electrical Engineering
SEMESTER: - VII
CODE: - 4TE07EMD1
NAME –Electrical Machine Design - 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	
4TE07EMD1	Electrical Machine Design - I	4	0	2	6	5	30	1.5	70	3	--	20	30	150

Objectives

- To study various Electrical advance machines design Namely Synchronous machine, Sage Machine, Permanent Brushless motor, modelling and mathematic modal of advance machine and performance of design applications system.
- To study design and implementation of modelling circuits using Advance machine
- To study design and simulation of Advance machines

Prerequisites

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

Course Outlines

Sr. No.	Course Contents	Hours
1	Basic Considerations In Electrical Machines Design: Design factors, Limitations in design, Modern trends in design of electric machines, Conducting materials, Magnetic materials, Insulating materials and its classification. Temperature rise, Expression for temperature rise, heating and cooling time constants, examples. Types of duties and ratings, Types of enclosure, Selection of motor capacity, examples. Cooling of machines.	12
2	Design of Transformer: Specification, Output equation of transformer, Output equation- Volt per turn. Stacking factor, Ratio of iron loss to copper loss, Relation between core area and	16

	weight of iron and copper. Optimum designs, variation of output and losses in transformer with linear dimensions, examples. Design of core, Choice of flux density and current density, Choice of window space factor, window dimensions. Design of yoke, Overall dimensions, examples. Design of high voltage and low voltage winding, examples. Estimation of operating characteristics: Primary and Secondary resistance, Leakage reactance of windings, Regulation, examples. Mechanical forces, No load current calculation, Change of parameters with change of frequency. Temperature rise of transformer, Design of tank, examples. Design of Current Transformer: Introduction, construction, design principles, turns compensation.	
3	<p>Windings of Electrical Machines: Types of transformer windings. D.C. Armature Winding: Types of dc winding, terms related to armature winding, comparison between closed and open winding, simplex lap and wave winding, Duplex lap and wave winding, Dummy coils in wave winding, Equalizer connections, examples.</p> <p>A.C. Armature Winding: Number of phases and phase spread, classification of ac winding, Concentric winding, Mesh winding, Integral slot winding, and Fractional slot winding with examples.</p>	14
4	<p>Design Of Direct Current Machines: Field form, Carter's Fringe curves Specifications, Main Dimensions, Total Loadings, Specific Loadings, Choice of Specific Magnetic Loading, Choice of Specific Electrical Loading, Interdependence of B_{av} and ac Output equation, Factors affecting size of machines, Separation of D and L Selection of number of poles, examples Core length, Armature diameter, Pole proportions, Number of ventilating ducts, Estimation of Length of air gap, examples. Armature reaction and its effects, Reduction of effects of armature reaction.</p> <p>Armature Design: Number of armature conductors, Number of armature coils, Number of armature slots, Cross section area of conductors, Slot dimensions, Armature voltage drop, Depth of armature core, examples. Design of Yoke, Magnetic circuit. Design of field system, Design of shunt and series winding, examples. Improvement in commutation Design of Interpoles, Design of Commutator and Brushes and examples.</p>	16

Learning Outcomes

The students would be able to design and implement various Introductions to mathematical computational and simulation software in electrical advance machine. Solving ODEs using computational software Development of Process Simulator. It also provides foundation to understand advance electrical machine.

Books Recommended

1. "The Performance And Design Of Alternating Current Machines", by M. G. Say CBS Publishers and Distributors.
2. "A Course In Electrical Machine Design" by A. K. Sawhney and A. Chakrabarti, Dhanpat Rai and Co.

3. "Design Of Rotating Electrical Machines" by Juha Pyrhonen, Tapani Jokinen, Valeria Hrabovsova, Wiley publication.
4. "Design of Electrical Machines", by K.G.Upadhyay, New age international publishers.
5. "Design of Electrical Machines", by V. N. Mittal and A. Mittal, Standard Publishers distributors.
6. "Electric Machinery" 6th Edition, by A. E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, Tata Mcgraw Hill.
7. "Elements Of Electrical Design' by J. G. Jamnani, 2nd Edition, Mahajan publishing house.