

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Electrical Machine Design – I
Course Code:	1ET1090604
Pre-requisite Course:	Elements of Electrical Engineering, D.C machine and Transformer

Course Objectives:

1. This course is a preliminary course for design of various electrical machines.
2. The course also includes basics of estimation and costing of residential wirings and commercial wirings.
3. The design of various starters, field regulators and choke coil includes in this course.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	-	2	4	28	70	12	30	12	30	08	20	150

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	GENERAL DESIGN ASPECTS: Basic principles of magnetic circuits – use of B-H curves in magnetic circuit; Calculations of MMF for air gap and teeth; Real and apparent flux density; Field Form; Air gap flux distribution factor (field form factor).	5	10
2	DESIGN OF STARTERS, FIELD REGULATORS AND SMALL TRANSFORMERS: Design of starters and Field regulators, Design of Small single-phase transformers; Design of variable air gap single phase and three phase choke coil.	6	15
3	DESIGN CONSIDERATION OF ELECTRICAL INSTALLATION: Types of load, Electrical Supply Systems, wiring systems, Load Assessment, Permissible voltage drops & Conductor size calculations.	4	10
4	ESTIMATION AND COSTING FOR RESIDENTIAL AND COMMERCIAL WIRING: Preparation of schematic diagrams and estimation of cost of wiring for Tenements, Row houses, Bungalows, Flats, Multi – Storied Buildings, Commercial Complexes like Offices, Hospitals, Hotels and Theatres.	4	10

5	DESIGN OF ARMATURE WINDINGS: DC windings: Simplex & Duplex windings; Lap & Wave windings; Basic terms related to armature windings; Dummy Coils; Equalizer connections; AC windings: Introduction; No. of phases; Phase spread; Concentric winding, Whole coil winding; Mush winding.	8	20
6	DESIGN OF DC MACHINES: Introduction; Output equation; Factors affecting size of machines; Criteria for selection of specific loadings; MMF calculation; Selection of number of poles; Design of core length and armature diameter; Design of length of air gap; Numerical examples. ARMATURE DESIGN: Choice of armature winding; Armature conductor; Number of armature slots; Slot dimensions; Slot loading; Design of armature core; Numerical examples. DESIGN OF FIELD SYSTEMS: Pole design; Design of field winding of shunt, series and compound machines; Design of inter poles; Design of commutator and brushes; Numerical examples.	18	35

Reference Books

1. A course in electrical machine Design – A. K. Sawhney, Dhanpat rai & co, 1998.
2. Elements of Electrical Design – J G Jamnani, Mahajan Publication, 2009.
3. Electrical Machine Design – R. K. Agrawal, kataria & sons, 2004.
4. Design of Electrical Machine- V. N. Mittle , Standard Publishers distributors, 2000.

List of Experiments:

- During the laboratory hours, the design problems based on the syllabus should be assigned to the students.
- After carrying out the detailed design, drawing sketches and winding diagrams should be prepared by the students.
- Minimum five drawing sheets must be prepared and evaluated at the end of the term.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the knowledge regarding Design of winding diagrams and overall design of DC machine of given specifications.	2 Understanding
CLO2	To design the transformers of given specifications.	5 Evaluate
CLO3	Prepare the detailed sketches of the designed machines and Estimate the cost of wirings.	1 Remembering 4 Analyze
CLO4	List the steps for design of armature winding of D.C. Machines.	1 Remembering
CLO5	To design the field system of D.C. Machines.	5 Evaluate
CLO6	Understand the general designing aspects.	2 Understanding

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1			L		M					L			M			L
CLO2		M					L		L		L				L	
CLO3	L			L		M		L		L		M	L			
CLO4			M		L		M							M		
CLO5		L		M		L			L			M				
CLO6			M		H			M		L					M	L

H: High, M: Medium, L: Low