

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Elements of Electrical Design
Course Code:	2ET1090503T
Pre-requisite Course:	Elements of Electrical Engineering, Electrical Machines

Course Objectives:

1. The objective of the course is to Understand the basic concepts of magnetic circuit.
2. It also deals with the design of different types of small transformers.
3. Develop the winding diagrams for AC and DC machines are discussed in detail.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	General Design Aspects: Concept of magnetic circuits, Use of B-H curves in magnetic circuits, Calculations of MMF, Real and apparent flux density, Effect of saturation, Flux density distribution, Calculation of magnetizing current, Field form, Flux plotting, Air gap flux distribution factor, Actual flux distribution factor, Magnetizing current calculation, Leakage reactance calculation for various types of slots, Iron loss calculation, Examples related to above topics.	10	22
2	Design of Electromagnets: Introduction, Types of Electromagnets, Design of magnet coils, Design of flat faced armature type circular electromagnet, Design of horse shoe type magnet, Design of plunger type magnet, Design of magnetic clutches.	07	16
3	Design of Starters, Field regulators & Control panels: A.C. and D.C. starters, Field regulator and general purpose control panels.	05	10
4	Design of small Transformers: Design of Small single-phase transformers, Design of welding transformers.	05	10
5	Design of Choke coils: Design of variable air gap single-phase choke coil, Design of variable air gap three-phase choke coil.	05	10
6	Design of Armature Windings: DC windings: Simplex & Duplex windings; Lap & Wave windings, Applications, Basic terms related to armature windings; Dummy coils, Equalizer connections, Split coils.	07	16

	AC windings : Definitions, Concentric winding, No. of phase & phase spread, Mush winding, Double layer winding, Integral slot lap & wave winding, fractional slot winding, Software based design approach of Armature winding.		
7	Design consideration of Electrical Installation: Types of load, Electrical supply systems, Wiring systems, Load assessment, Permissible voltage drops & conductor size calculations, Wiring diagram, Schematic diagram, Electrical design for residential & commercial buildings.	06	16

Text Books:

1. A. K. Sawhney, "Electrical Machine Design", Dhanpatrai & sons. Publication, 6th edition-2018.
2. K. B. Raina & S. K. Bhattacharya, "Electrical Design, Estimating & Costing", New Age International Publication, 2013.

Reference Books:

1. N. Alagappan & S. Ekambaram, "Electrical estimating & costing", Tata McGraw hill Ltd., 2013.
2. Surjit Singh, "Electrical Estimating & Costing", Dhanpat Rai & sons, 5th edition-2014.
3. S. K. Sen, "Electrical Machine Design", Oxford Publications, 2014.
4. Miller, T.J.E., "Brushless permanent magnet and reluctance motor drives", Oxford, 3rd edition-2017.
5. Say M. G, "The performance and design of alternating current machines", CBS Publishers, 2008.

ICT/MOOCs Reference:

1. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/117108124/lec16.pdf
2. [https://nptel.ac.in/content/storage2/courses/108105053/pdf/L-35\(TB\)\(ET\)%20\(\(EE\)NPTEL\).pdf](https://nptel.ac.in/content/storage2/courses/108105053/pdf/L-35(TB)(ET)%20((EE)NPTEL).pdf)
3. <https://nptel.ac.in/courses/108/108/108108076/>

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the basic concepts of magnetic circuit.	2 Understanding
CLO2	Design the basics of electrical starter and field regulators.	5 Evaluating
CLO3	Understand the design of different types of small transformers, electromagnets and choke coils.	2 Understanding
CLO4	Develop the winding diagrams for AC and DC machines.	6 Creating
CLO5	Design the Electrical installation for residential & commercial buildings.	5 Evaluating

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	H	M	M	L	L	L			L		L	L	L	L	L	
CLO2	H	H	H	M	L	L			L		L	L		M		H
CLO3	H	H	H	M	M	L			M		L	L	H	L	L	L
CLO4	H	H	H	L	L				M		L	L		M		
CLO5	H	H	H	M	M	M			H		L	M		H	L	

H: High, M: Medium, L: Low