ELECTRICAL MACHINE DESIGN

Course Code	20EE4501B	Year	III	Semester	I
Course Category	Professional Elective-I	Branch	E.E. E	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Electrical Machines – I &II
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Classify** the materials used for construction of electrical machines(L2)
CO2	**Assess** the overall dimensions of a transformer. (L3)
CO3	**Examine** the design, performance of transformer (L4)
CO4	**Develop** the overall dimensions of a rotating machine. (L3)
CO5	**Analyze** the design and performance of rotating machines. (L4)
CO6	**Submit a report** on design of electrical machines

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3			3				1				1	2	1
CO3		3	3										2	1
CO4	3			3				1				1	2	1
CO5		3	3										2	1
CO6						1			3	3	1			

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Fundamental Aspects of Electrical Machine Design** Design of machines - design factors - limitation in design - modern trends in electrical machine design – types of magnetic, electric and insulating materials – modes of heat dissipation – cooling of rotating machines – methods of cooling. **Computer Aided Design (CAD) of Electrical Machines** Limitations and assumptions in traditional designs, need of CAD, analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation	CO1 CO2 CO4 CO6
II	**Design of transformers** Transformer windings – output equation – design of main dimensions-– design of core - choice of flux density – determination of number of turns and length of mean term - resistance and leakage reactance – no load current calculation –cooling of transformers- calculation of number of tubes.	CO1 CO2 CO3 CO6

III	**Design of DC Machines** Output equation –selection of specific magnetic and electric loadings - separation of D and L – estimation of number of conductors, armature slots and conduct dimensions – choice of number of poles and calculation of length of airgap – design of field systems, interpoles and brushes.	CO1 CO4 CO5 CO6
IV	**Design of Induction motors** output equation -main dimensions – choice of average flux density and ampere conduction for meter — design of stator slots and rotor slots- design of rotor bars end rings– design of wound rotor – design of no-load current.	CO1 CO4 CO5 CO6
V	**Design of Synchronous Machines** Types of construction – output equation - main dimensions – short circuit ratio and its effects on the performance – design of rotor –Design of field winding – Design of turbo alternators – Rotor design temperature rise and its effects.	CO1 CO4 CO5 CO6

Learning Resources

Text Books

1. A.K.Sawhney , "A Course in Electrical Machines Design" , Dhan path Rai & Co. 6th edition 2010.

Reference Books

1. AE Clayton and NN Hancock, "The Performance and Design of Direct Current Machines", CBS Publishers, 3rd edition, 2004.
2. M.G. Say, "Performance and Design of A.C. Machines", ELBS and Pitman & Sons, 4th edition, 2013.
3. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Company Pvt. Ltd. New Delhi, 2nd edition,2006.
4. K. M. Vishnu Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 1st edition 2008.

Web Links

1. https://cusp.umn.edu/electric-machine-design-videos
2. https://nptel.ac.in/courses/108102146
3. https://nptel.ac.in/courses/108/105/108105017

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