SARDAR RAJA COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MICRO LESSON PLAN

SUBJECT NAME : DESIGN OF ELECTRICAL MACHINES

SUBJECT CODE : EE2355

YEAR : III YEAR EEE

SEM : VI

STAFF NAME

Mrs S.MALATHI

ASST.PROF / EEE

EE2355 DESIGN OF ELECTRICAL MACHINES L T P C 3 1 0 4

UNIT I INTRODUCTION 9

Major considerations in Electrical Machine Design - Electrical Engineering Materials – Space factor – Choice of Specific Electrical and Magnetic loadings – Thermal considerations - Heat flow – Temperature rise - Rating of machines – Standard specifications.

UNIT II DC MACHINES 9

Output Equations – Main Dimensions - Magnetic circuit calculations – Carter's Coefficient – Net length of Iron –Real & Apparent flux densities – Selection of number of poles – Design of Armature – Design of commutator and brushes – performance prediction using design values.

UNIT III TRANSFORMERS 9

Output Equations – Main Dimensions - KVA output for single and three phase transformers –Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise in Transformers – Design of Tank - Methods of cooling of Transformers.

UNIT IV INDUCTION MOTORS 9

Output equation of Induction motor – Main dimensions – Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor -– Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current - Short circuit current – Circle diagram - Operating characteristics.

UNIT V SYNCHRONOUS MACHINES 9

Output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.

2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

REFERENCES

1. A.Shanmugasundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age Intenational Pvt. Ltd., Reprint 2007.

SUBJECT DESCRIPTION AND OBJECTIVES

DESCRIPTION

To design the electrical machines properly, one should be familiar with the following aspects of electrical engineering. Various electrical materials and their properties. Properties of magnetic and electric fields. Laws governing electric circuits. Laws of electromagnetic induction. Calculation of magnetic circuits. · Construction of various types of electrical machines. Behavior of electrical machines under working conditions. Industrial Standards, Transformer Design

Specifications, Core Design, Winding Design, Iron and Copper Losses, Insulation System, Cooling Mechanisms, Tank Design, Design of Induction Motor, Design Specifications, Stator and Rotor Design, Iron and Copper Losses, Thermal Mechanism and Cooling Single Phase Induction Motors Design.

In this subject the description of magnetic and insulating materials, heating and cooling of electrical machines and some concepts which are needed while designing the electrical machines are described in detail. The steps required for conventional design of transformer, 3-phase alternator, 3-phase induction motor and d.c. machines are described in detail.

AIM

To expose the students to the concept of design of various types of electrical machines and to completely obtain the dimensions of all the parts of the machine to furnish the data to the manufacturer. The main aim of carrying out the design is to achieve the following. Lower cost, Lower weight, Reduced size, Better operating performance.

OBJECTIVES

The main objective of this subject is to make students capable of efficiently designing electrical machines and To provide sound knowledge about constructional details and design of various electrical machines.

i. To study mmf calculation and thermal rating of various types of electrical machines.
ii. To design armature and field systems for D.C. machines.
iii. To design core, yoke, windings and cooling systems of transformers.
iv. To design stator and rotor of induction machines.
v. To design stator and rotor of synchronous machines and study their thermal behavior.

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EE2355 DESIGN OF ELECTRICAL MACHINES
MICRO LESSON PLAN

Hours	LECTURE TOPICS	READING
	UNIT- I. INTRODUCTION	
1	Major considerations in Electrical Machine Design.	T1
2	Electrical Engineering Materials.	T1
3	Electrical Engineering Materials.	T1
4	Space factor.	T1
5	Choice of Specific Electrical and Magnetic loadings.	T1
6	Thermal considerations.	T1
7	Heat flow.(AV Class)	T1
8	Temperature rise.	T1
9	Rating of machines.	T1
10	Standard specifications.	T1
11	Problems	T1
12	Problems	T1

Hours	LECTURE TOPICS	READING
	UNIT- II DC MACHINES	
13	Output Equations	T1
14	Main Dimensions	T1
15	Magnetic circuit calculations	T1
16	Carter's Coefficient, Net length of Iron	T1
17	Real & Apparent flux densities	T1
18	Selection of number of poles	T1
19	Design of Armature.(AV Class)	T1
20	Design of commutator and brushes	T1
21	Performance prediction using design values.	T1
22	Problems	T1
23	Problems	T1
24	Problems	T1
	UNIT- III TRANSFORMERS	
25	Output Equations	T1
26	Main Dimensions	T1
27	KVA output for single and three phase transformers	T1
28	Window space factor, Overall dimensions	T1
29	Operating characteristics	T1
30	Regulation, No load current	T1
31	Temperature rise in Transformers	T1
32	Design of Tank	T1
33	Methods of cooling of Transformers. (AV Class)	T1
34	Problems	T1
35	Problems	T1
36	Problems	T1
	UNIT- IV INDUCTION MOTORS	
37	Output equation of Induction motor	T1
38	Main dimensions, Length of air gap	T1
39	Rules for selecting rotor slots of squirrel cage machines	T1
40	Design of rotor bars & slots.(AV Class)	T1
41	Design of end rings, Design of wound rotor	T1
42	Magnetic leakage calculations	T1
43	Leakage reactance of polyphase machines	T1
44	Magnetizing current, Short circuit current	T1
45	Circle diagram	T1
46	Operating characteristics	T1
47	Problems	T1
48	Problems	T1
	UNIT- V SYNCHRONOUS MACHINES	
49	Output equations, Choice of loadings	T1
50	Design of salient pole machines	T1
51	Short circuit ratio, Shape of pole face	T1
52	Armature design, Armature parameters	T1
53	Estimation of air gap length	T1

Hours	LECTURE TOPICS	READING
54	Design of rotor, Design of damper winding.(AV Class)	T1
55	Determination of full load field mmf	T1
56	Design of field winding	T1
57	Design of turbo alternators	T1
58	Rotor design	T1
59	Problems	T1
60	Problems	T1