PROGRAMME ELECTIVES

18EEP01	ELECTRICAL MACHINE DESIGN	L	T	P	C
		3	0	0	3

Course Objectives:

1.	To Study mmf calculation and thermal rating of various types of electrical machines
2.	To Design armature and field systems for D.C. machines.
3.	To Design core, yoke, windings and cooling systems of transformers.
4.	To Design stator and rotor of induction machines.
5.	To Design stator and rotor of synchronous machines and study their thermal behaviour

UNIT I	INTRODUCTION	9	+	0

Major considerations – Limitations – Electrical Engineering Materials – Space factor – temperature gradient – Heat flow in two dimensions – thermal resistivity of winding – Temperature gradient in conductors placed in slots – Rating of machines – Eddy current losses in conductors – Standard specification

UNIT II	DC MACHINES	9	+	0

Magnetic circuit calculations – Net length of Iron –Real & Apparent flux densities – Design of rotating machines – D.C machines output equations – Main dimensions-Selection of number of poles – Armature design – Design of commutator and brushes-Design of slot, air gap, field coils.

UNIT III	TRANSFORMERS	9	+	0

KVA output for single and three phase transformers – Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise of Transformers– Design of Tank with & without cooling tubes – Thermal rating – Methods of cooling of Transformers – Design of chokes – Design of welding Transformers – Design of CTs &PTs.

UNIT IV	INDUCTION MOTORS	9	+	0

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-Operating characteristics –Short circuit current –Dispersion co efficient – relation between D & L for best power factor.

UNIT V	SYNCHRONOUS MACHINES	9	+	0

Runaway speed – construction – 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 – Introduction to computer aided design – Program to design main dimensions of Alternators.

Total (45+0)= 45 Periods

Course Outcomes:

Upon completion of this course, the students will be able to:

CO1	:	Know the philosophy of design and thermal rating of Electrical machines.
CO2	:	Remember for the component of magnetic and electrical loading of AC and DC Machines.
CO3	:	Design Armature and Field Systems for DC Machines.
CO4	:	Design core, windings and cooling system of transformers.
CO5	:	Design Stator and rotor of Induction Machines.
CO6	:	Design Rotor of synchronous machines and understand their thermal behaviour.

Text Books:

1.	Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 2010,6th edition.

2.	Sen.,S.K., 'PrinciplesofElectricalMachineDesignswithComputerProgrammes', OxfordandIBHPublishingCo.Pvt.Ltd.NewDelhi,2014,3rd edition.
Reference Books:	
1.	R.K.Agarwal, Principles of Electrical Machine design, S.K. Kataria and Sons, Delhi 2014 5th edition.
2.	V.N. Mittle, ' Design of Electrical Machines', Standard Publications and Distributors, Delhi, 2002.
E- References	
1	http://cusp.umn.edu/machine_design.php

CO/PO Mapping

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