

DC MACHINES & TRANSFORMERS

Course Code	23EE3302	Year	II	Semester(s)	I
Course Category	Professional Core	Branch	EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Basic Electrical and Electronics Engineering
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	Understand the basic concepts of construction and operation of DC machines, single phase transformer, auto transformer and three phase transformers. (L2)
CO2	Apply the basic knowledge to obtain the desired parameters/performance characteristics of DC machines. (L3)
CO3	Apply the basic knowledge to obtain the desired parameters/performance characteristics of single phase transformer, auto transformer and three phase transformer. (L3)
CO4	Analyze the performance characteristics, speed control methods and testing techniques of DC machines. (L4)
CO5	Analyze the different configurations and testing techniques of single phase transformer, auto transformer and three phase transformer. (L4)
CO6	Capability to understand the concepts of DC machines, single phase transformer, auto transformer and three phase transformer and submit a report.

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												2	1
CO3	3												2	1
CO4		3											2	1
CO5		3											2	1
CO6								3	3				2	1

SYLLABUS

Unit No.	Contents	Mapped CO
I	DC Generators: Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques – characteristics of DC generators – applications of DC Generators, Back-emf and torque equations of DC motor – Armature reaction and commutation	CO1 CO2 CO4 CO6

II	Starting, Speed Control and Testing of DC Machines Characteristics of DC motors – losses and efficiency – applications of DC motors. Necessity of a starter – starting by 3-point and 4-point starters – speed control by armature voltage and field current control – testing of DC machines – brake test, Swinburne’s test –Hopkinson’s test–Field Test.	CO1 CO2 CO4 CO6
III	Single-phase Transformers Introduction to single-phase Transformers (Construction and principle of operation)–emf equation – operation on no-load and on load –lagging, leading and unity power factors loads –phasor diagrams– equivalent circuit – regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency.	CO1 CO3 CO5 CO6
IV	Testing of Transformers Open Circuit and Short Circuit tests – Sumpner’s test – separation of losses– Parallel operation with equal and unequal voltage ratios– auto transformer – equivalent circuit – comparison with two winding transformers.	CO1 CO3 CO5 CO6
V	Three-Phase Transformers: Polyphase connections- Y/Y, Y/ Δ , Δ /Y, Δ / Δ , open Δ and Vector groups – third harmonics in phase voltages– Parallel operation–three winding transformers – off load and on load tap changers–Scott connection.	CO1 CO3 CO5 CO6

Learning Resources

Text Books

1. Dr.P. S Bimbhra, Electrical Machinery, 7/e, Khanna Publishers,2018.
2. I.J. Nagarath and D.P. Kothari, Electric Machines,4/e, McGraw Hill, 2010.

Reference Books

1. J.B. Gupta, Theory and performance of Electrical Machines, S.K.Kataria & Sons Publishers,2015.
2. A.E. Clayton and N N Hancock, Performance and Design of DC Machines, Oxford,1987.
3. Abhijit Chakrabarti and Sudipta Debnath, Electrical Machines, 1/e, Mc Graw Hill,2015.
4. S.J. Chapman, Electric Machine Fundamentals, 5/e, McGraw Hill, 2011.

e- Resources

<https://nptel.ac.in/courses/108/105/108105155/>