

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NEEC206	ELECTRICAL MACHINES - I	3	1	0	4

Course Objective
To analyze the design considerations, performance and application of different types of Transformers and DC machines (both Generator and Motor) used in Electric power system.
Learning Outcomes
Upon successful completion of this course, students will be able to: - analyze the performance of single-phase and three-phase transformers under different operating conditions and their applications, - determine losses, efficiency, regulation from test data of single-phase and three-phase transformers - know the different possible connections of three-phase transformers and their application - understand the torque production mechanism of DC machines (both generator and Motor) and their operating characteristics at during different operating conditions, - understand speed control mechanism of DC motors and their applications.

Unit No.	Topics to be Covered	Lecture + Tutorial	Learning Outcome
1	Single-Phase Transformers: Equivalent circuit, testing and efficiency, all-day efficiency, voltage regulation; parallel operation of single-phase transformer, Auto transformers (construction, operation and application).	14L + 2T	Understanding the mathematical modelling of single-phase transformer, calculation of different parameters like voltage regulation, efficiency from test data.
2	Three-Phase Transformer: Construction, connections, phase groups, testing and operation of three-phase transformers, different types of transformers and their applications (Three winding transformers, Scott connected transformers), tertiary windings, harmonics, magnetizing inrush current.	10L + 3T	Understanding the construction, operating principle, testing, different possible connection methods of three-phase transformer and their different applications.
3	DC Machines: Operation, construction, EMF and torque equations, armature reaction and commutation, inter poles, compensating windings in DC Machines.	4L + 3T	Understating the construction, operating principle and torque development of DC machines, in addition to know the different other phenomena such as commutation, need of compensating winding in DC machine.
4	DC Generators: Types and operating characteristics of DC generators, parallel operation of DC generators.	7L + 3T	Understanding the different operating characteristics of DC generator, need and procedure of parallel operation of DC generator.
5	DC Motors: Types and operating characteristics of DC motors, starting, speed control and braking of DC shunt motors, application of DC motors.	7L + 3T	Understanding the different operating characteristics DC motor, speed control and application of DC motor.
	Total	42L + 14T	

Text Books:

1. Electric Machines – D. P. Kothari and I. J. Nagrath (Tata McGraw Hill), 4th Edition, Wiley, 2010.

Reference Books:

2. Electrical Machines – P. S. Bimbhra (Khana Publ.), 2011.
3. Electric Machinery – Fitzgerald, Charles Kingsley Jr., S. D. Umans (Tata McGraw Hill)