

NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering
Semester – IV

L	T	P	C
3	0	2	4

Course Code	2EE404
Course Title	Transformers and DC Machines

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. understand the construction and operating principle of transformers and DC machines.
2. acquire knowledge on performance indices of transformers and DC machines.
3. select transformers and DC machines for specific application based on characteristics.
4. understand the use of Permanent Magnet materials in DC machines.

Syllabus:

Teaching Hours: 45

Unit-0: Electromechanical Energy Conversion

02

Principles of energy conversion, singly excited magnetic system, doubly excited magnetic system

UNIT-1: Single-Phase Transformers

12

Construction and principle of single phase transformer, operation at no load and on load, inrush current, harmonics in transformer, phasor diagram, equivalent circuit, losses, efficiency and regulation, all – day efficiency, concept of power and distribution transformer, determination of voltage regulation, parallel operation of single phase transformers, auto-transformer, efficiency by direct load test and indirect test methods

Unit-2: Polyphase Transformers

13

Construction and transformer types, different types of connections and their phasor diagrams, selection of the transformer connections for power system applications, parallel operation of two winding transformer, load sharing, Scott connection, tertiary winding, types of windings, short circuit forces on transformers, cooling of transformers, accessories and protection of transformers, various tests on transformers

Unit-3: DC Machines

08

Construction and operating principle of D.C. machines, emf equation, types, concept of back emf, motor torque equation, characteristics, power flow diagram, speed control, commutation, Concept of DC generators

Unit-4: Permanent Magnet materials and PMDC Motors

10

Types of magnetic and permanent magnet materials, B-H loop and demagnetization characteristics, temperature dependence and effects, mechanical properties, construction and working of PMDC motors, characteristics and applications of PMDC machines

Self-Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

This shall consist of at least 10 laboratory experiments / simulations based on the syllabus.

Suggested Readings:

1. E. Fitzgerald, Electric Machinery, TMH Publications.
2. M. G. Say, Alternating Current Machines, CBS publishers.
3. Nagrath and Kothari, Electrical Machines, TMH Publications.
4. P. S. Bhimbra, Electrical Machinery, Dhanpatrai Publishers.
5. Venkatratnam K., Special Electric Machines, CRC Press.
6. Janardanan E. G, Special Electrical Machines, Prentice Hall India Learning Pvt. Ltd.
7. Miller T. J. E., Brushless Permanent Magnet and Reluctance Motor Drives, Clarendon Press.
8. Hanselman D., Brushless Permanent-magnet Motor Design, McGraw Hill.
9. B. L. Theraja, Electrical Technology, Vol. – II, S. Chand & Co.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards