

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

L	T	P	C
2	0	2	3

Course Code	2EEDE54
Course Title	Special Electrical Machines

Course Outcomes (COs):

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

1. analyze properties and characteristics of permanent magnet materials
2. analyze constructional & operational aspects of permanent magnet brushless machines and switched reluctance machines
3. evaluate performance of permanent magnet brushless machines and switched reluctance machines
4. select appropriate machine based on application requirements.

Syllabus:

Teaching Hours: 30

Unit-1: Permanent Magnet Materials

03

Types, properties and characteristics of permanent magnets, features of permanent magnet excitation, magnetic circuit model, sintered permanent magnet and bonded permanent magnet materials, handling of permanent magnets

Unit-2: Permanent Magnet Brushless DC Motors

14

Construction, operating principle & features of permanent magnet brushless dc (PMBLDC) motors, various types of PMBLDC motors, magnetic circuit model, armature reaction, derivation of emf and torque equation, types of emf generated, performance characteristics, closed loop control of PMBLDC motors, sensor less control of PMBLDC motors, case studies considering applications viz. electric vehicle, marine propulsion & PV fed water pumping, advancements in topologies and reviews, generating action of PM machines

Unit-3: Switched Reluctance Motors

13

Construction, operating principle and features of switched reluctance motors (SRM), equivalent magnetic circuit, inductance profile, derivation of torque equation and factors affecting torque, performance characteristics, control of SRM, various types of converters, closed loop control of SRM, sensor less control of SRM, case studies considering applications viz. electric vehicle, washing machine and etc., advancements in topologies and reviews

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. Venkatratnam K., Special Electric Machines, CRC Press.
2. Miller T. J. E., Brushless Permanent Magnet and Reluctance Motor Drives, Clarendon Press.
3. R. Krishnan, Permanent Magnet Synchronous and Brushless DC Motor Drives, CRC Press.
4. Recent papers from IEEE transactions and reputed journals

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

w.e.f. academic year 2020-21 and onwards