

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech. in Electrical Engineering
Semester:	VII
Course Code:	2EEDE64
Course Title:	Design of Special Electrical Machines
Course Type:	(<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course / <input checked="" type="checkbox"/> Department Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/ <input type="checkbox"/> Open Elective/ <input type="checkbox"/> Any other)
Year of Introduction:	2021 – 22

Credit Scheme

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

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

1. understand and apply design aspects of special electrical machines
2. select appropriate materials for design of special electrical machines
3. design special electrical motors
4. analyze performance of special electrical machines

Syllabus:

Total Teaching hours: 30

Unit	Syllabus	Teaching hours
Unit-I	Permanent Magnets Permanent magnets and magnetic circuit, selection of type of permanent magnet, estimation of flux, latest trends in magnet technology.	03
Unit-II	Design of Permanent Magnet Brushless DC Motors General introduction, back emf & force, emf constant, torque constant, performance characteristics, rotor variations, stator variations, design considerations, basic sizing rules, slotted stator design, rotor design, performance estimation, performance improvement with design modifications.	14
Unit-III	Design of Switched Reluctance Motors General introduction, magnetic equivalent circuit, calculation of aligned inductance and unaligned inductance, performance characteristics, design considerations, basic sizing rules, stator design, rotor design, performance estimation, performance improvement with design modifications.	13

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 05 design / simulation exercises based on the syllabus.

Suggested Readings/ References:

1. T. J. E. Miller, Brushless PM and Reluctance Motor Drives, Clarendon Press Oxford.
2. D. C. Hanselman, Brushless Permanent Magnet Motor Design, McGraw Hill.
3. R. Krishnan, Switched Reluctance Motor Drives, CRC Press.
4. Latest publications from referred journals.

Suggested List of Simulations / Experiments:

1. Steady state FE analysis of Electromagnet.
2. Magnetic circuit analysis of Permanent Magnet Brushless DC Motor.
3. Sizing of Permanent Magnet Brushless DC Motor.
4. Validation of design of Permanent Magnet Brushless DC Motor with simulation analysis.
5. To analyze effect of stator geometry on back emf waveform of Permanent Magnet Brushless DC Motor.
6. Magnetic circuit analysis of Switched Reluctance Motor.
7. Sizing of Switched Reluctance Motor.
8. Validation of design of Switched Reluctance Motor with simulation analysis

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

w.e.f. academic year 2021 - 22 and onwards