NIRMA UNIVERSITY
Institute of Technology
Electrical Engineering Department
B. Tech. Programme (All Branches Except EE)

L	T	P	C
3	0	0	3

Course Code	**Open Elective (OEXXX)**
Course Title	**Electric Machines and Applications**

Course Learning Outcomes (CLOs):

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

1. analyze constructional aspects, operational aspects and performance of electric machines.
2. adopt suitable control methods for operating electric machines.
3. select appropriate electric machines based on constructional & operational characteristics.

Syllabus **Teaching Hours: 45**

Unit - 1: DC Motors **09**

Construction & operating principle, types of DC motors, PMDC motors, back-emf and its importance, torque production, characteristics, various losses & performance estimation, speed control, applications

Unit-2: Transformers **11**

Construction & operating principle-single phase and three phase, types of transformer, turn-ratio, equivalent circuit, various losses & performance estimation, parallel operation, applications

Unit-3: Induction Motors **11**

Construction & operating principle of three phase machines, types of induction motors, torque production, torque-slip characteristic, equivalent circuit representation, various losses & performance estimation, speed control, single phase ac motors, universal motors and applications

Unit-4: Permanent Magnet Brushless DC (PMBLDC) Motors **04**

Construction and operating principle, torque and emf equations, torque/speed characteristic: performance and efficiency, controllers for PMBLDC motors, applications

Unit-5: Stepper and Servo Motors **10**

Basics of stepper motor, construction, working and characteristics of variable reluctance (VR) stepper motors, micro stepping control of stepper motor, construction and working of multistack VR stepper motor, construction and working of permanent magnet (PM) stepper motor, construction and working of hybrid stepper motor, servo motor types, construction and operation of servo motors, servo motor controllers, applications

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.

Suggested Readings:

1. A. E. Fitzerald, Charles Kingsley and Stephen D Umans, Electric Machinery, TMH Publication.
2. B.L.Theraja, A.K. Theraja, A Textbook of Electrical Technology Volume-II, S. Chand & Co.
3. P. S. Bhimbra, Electrical Machinery, Dhanpatrai Publishers.

4. Miller T. J. E., Brushless Permanent Magnet and Reluctance Motor Drives, Clarendon Press.
5. V. V. Athani, Stepper Motors: Fundamentals, Applications and Design, New Age International Pvt. Ltd.
6. P. C. Sen, Principles of Power Electronics, John Wiley and Sons.
7. Y. Dote and S. Kinoshita, Brushless Servomotors-Fundamentals and Applications, Clarendon Press, Oxford.

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

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