

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

L	T	P	C
2	0	2	3

Course Code	2EE602
Course Title	Electric Drives

Course Outcomes (COs):

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

1. select appropriate drive based on load dynamics
2. analyse the performance of ac drives for various operating conditions
3. suggest suitable control technique with appropriate protection for electric drives
4. select appropriate motor as well as its control for traction applications

Syllabus:

Teaching Hours: 30

Unit-1: Fundamental of Electric Drives 05

Basic concepts, characteristics and operating modes of drive motors, starting, braking and speed control of motors, four quadrant drives, nature and classification of load torque and associated controls, selection of motors

Unit-2: AC Motor Drives 16

Operation with unbalanced source voltages and unbalanced rotor impedances, effect of time harmonics on the motor performance, stator voltage control of induction motor, variable voltage variable frequency (VVVF) operation, voltage source inverter (VSI) fed induction motor drive, static rotor resistance control, slip power recovery systems, closed loop control of ac drives, space vector control of induction motor, introduction to field oriented control of ac motors, concept of self-commissioned drives.

Unit-3: Drive Protection 04

Standard protection features of motor and associated protection relays: thermal over load, phase to phase short circuit, single phasing, earth fault, unbalanced voltages, negative sequence currents, under/over voltages, under frequency, pole slip, stall protection and acceleration time

Unit-4: Electric Traction 05

Mechanics of train movement, speed-time curves, tractive effort for acceleration and propulsion, Power and energy output from driving axles, train resistance, adhesive weight and coefficient of adhesion, control of electric motors for traction, slip slide, regeneration and power flow

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 based on the syllabus.

Suggested Readings:

1. G. K. Dubey, Fundamental of Electrical Drives, Narosa Publication.
2. B.K. Bose, Power Electronics & Variable Frequency drive, IEEE press.
3. S. K. Pillai, First Course on Electrical Drives, Wiley Eastern Limited.
4. V. Subramanyam, Electric Drives– concepts and applications, Tata McGraw Hill.
5. Ned Mohan et al, “Power Electronics: Converters, Applications, and Design”, John Wiley & Sons. Inc., 2nd Edition, 1995.
6. Ned Mohan, Electric Machines and Drives: A First Course, Wiley publication.
7. H. Partab, Art and Science of Utilization of Electrical Energy, Dhanpat Rai & Sons.
8. G. C. Garg, Utilization of Electrical Power and Electrical Traction, Khanna Publication.
9. R. Krishnanan, Electric Motor Drives: Modeling, Analysis and Control, Pearson Publications.
10. Research papers and articles from reputed Journals.

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

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