

Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	NEEC515	Converter Controlled Machine Drives	3	1	0	4

Course Objective	
<ul style="list-style-type: none"> Review the role of Power Electronics for Modern Electric Drive systems, modelling of Drive components and their steady-state analysis, understanding the performance of closed-loop control of a DC, Induction and Synchronous Motor Drives, design of open- and closed-loop controller for an Electrical Drive system. 	
Learning Outcomes	
<ul style="list-style-type: none"> After completing the course, students will be able to analyse the performance of open-loop and closed-loop controlled DC motor and Induction Motor drives, compare their performance, perform system modelling and controller design for closed loop operation. 	

Unit No.	Topics to be Covered	Lecture Hours + Tutorial Hours	Learning Outcome
1	Introduction to Electrical Drives: Introduction, Power Devices and switching, Electrical Machines, Power Converters, Controllers, Loads, etc.	3L+1T	The students will learn about different components of an electrical drive and their characteristics.
2	Phase Controlled DC Motor Drives: Performance characteristics of different DC motors and load in four quadrants, Modelling of DC Motors and load, Single-phase and three-phase converter-controlled DC Motor Drives under continuous and discontinuous conduction, two- and four-quadrant converters for DC Motor Drives, Controller for phase-controlled converter, Steady-State analysis of a converter-controlled DC Drives. Design of current and Speed Controller, Industrial Applications.	10L+2T	The students will learn about DC motor drive using phase-controlled converters. They should be able to perform system modelling, closed loop controller design and performance analysis.
3	Chopper Controlled DC Drives: Four-quadrant Chopper for a DC motor under different Quadrants, Steady-State analysis of a chopper fed DC motor for continuous and discontinuous conduction mode, Closed-loop operation, Modelling and Design of Current Controllers, Industrial Applications.	6L+3T	The students will learn to model, design and carry out performance analysis of chopper-controlled DC motor drives.
4	Phase Controlled Induction Motor (IM) Drives: Performance of a 3-phase IM under stator voltage control, Closed-loop operation of IM under voltage control and Slip Energy Recovery Scheme. Effects of Harmonics on the IM performance.	7L+3T	The students will learn on operations and performance analysis of a three-phase IM under phase-controlled techniques and the closed-loop operations of IM under phase-controlled techniques.
5	Frequency Controlled IM Drives: Performance of a 3-phase IM under variable voltage and frequency operation, Constant v/f Control of IM under open- and closed-loop, pulse width modulation (PWM) techniques for IM drives, CSI based IM Drives, introduction to vector control, Industrial Applications.	10L+2T	The students will learn to analyse operation and performance of a three-phase IM under frequency-controlled techniques using PWM methods and the closed-loop operations of IM under frequency-controlled techniques.
6	Synchronous Motor Drives: Introduction and characteristics of different synchronous motor, Synchronous motor drives using variable frequency control, Introduction to Permanent Magnet AC motor drives.	6L+3T	The students will learn about operation and performance analysis of a three-phase synchronous motor under frequency-controlled techniques using PWM and the operations of different permanent magnet motors.
Total Contact Hours		42L+14T	

Text Books:

- Electric Motor Drives-Modelling, Analysis and Control- By R. Krishnan, Prentice Hall of India
- Modern Power Electronics and AC Drives- By Bimal K. Bose, Prentice Hall, PTR.

Reference Books:

- Fundamentals of Electrical Drives- By G. K. Dubey.