

16EE401 ELECTRIC DRIVES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HS	CS	SA	S	BS
45	-	30	5	40	-	8	5	-



Course Description and Objectives:

This course introduces the operation of electrical machines controlled by power electronic converters. The objective of the course is to make the students understand the speed control of DC and AC drives through power electronic converters.

Course Outcomes:

The student will be able to:

- understand the operation of controlled rectifier fed DC motors.
- understand the operation of chopper controlled DC motors.
- soft-start the Induction motor using AC-AC regulator.
- perform variable speed control of AC drives using DC-AC converter.

SKILLS:

- ✓ Suggest suitable converter for speed control of AC / DC drives.
- ✓ Design a converter for given load conditions of DC drive.
- ✓ Design a converter for given load conditions of AC drive.
- ✓ minimize current / torque ripples in a converter fed electric drive.

ACTIVITIES:

- *Simulate full controlled bridge converter fed DC motor using MAT LAB.*
- *Simulate half controlled bridge converter fed DC motor using MAT LAB.*
- *Static rotor resistance control of induction motor using MAT LAB.*
- *Simulate slip power recovery schemes using MAT LAB .*
- *Simulate regenerative braking of dc motor using MAT LAB .*

UNIT - 1**L-10**

FUNDAMENTALS OF ELECTRIC DRIVES : Block diagram of an electric drive, Parts of electric drives, Dynamics of electric drives, Fundamental torque equation, Speed-torque conventions and multi-quadrant operation, Equivalent values of drive parameters, Components of load torques, Nature and classification of load torques, Load Equalization and control of electrical drives.

UNIT - 2**L-9**

DC DRIVES - I : DC motors and their performance, Speed control - Constant torque and constant power control; Single phase controlled rectifiers with motor loads - Fully controlled and half controlled rectifier fed DC drives for continuous operation; Three phase controlled rectifiers with motor loads - Three phase semi and fully controlled converter fed DC drives for continuous operation, Speed-Torque characteristics, Problems.

UNIT - 3**L-9**

DC DRIVES - II : Four Quadrant operation of DC Drives – Dual converter fed control; Electric braking - Plugging, Dynamic and regenerative braking operations; Closed loop operation of DC motor, Chopper fed DC drives - Single quadrant, Two quadrant and four quadrant drives for continuous current operation, Problems.

UNIT - 4**L-9**

INDUCTION MOTOR DRIVES : Three phase induction motor equivalent circuit analysis and performance, Braking, Speed control - Variable frequency control from voltage source and current source, Rotor resistance control, Slip power recovery schemes and their industrial applications.

UNIT - 5**L-8**

SYNCHRONOUS MOTOR DRIVES : Operation from fixed frequency supply, Variable frequency control - VSI, CSI and Cyclo converter fed drives; Self-controlled and separate control mode of synchronous motor drives.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

Total hours: 30

1. Dynamic braking of DC motor.
2. Plugging of DC motor.
3. Half-controlled converter fed DC motor.
4. Fully controlled converter fed DC motor.
5. Dual converter fed DC motor.
6. AC voltage controller fed induction motor using anti-parallel SCRs and TRIAC.
7. Static rotor resistance control of induction motor.
8. Speed control of induction motor using v/f control method.
9. Open loop control of PMSM using voltage source inverter.
10. Self control mode of PMSM using cyclo converter.

TEXT BOOKS:

1. Gopal K. Dubey, "Fundamentals of Electric Drives", 2nd edition, Narosa Publishing house, 2009.
2. MD. Singh and K B Khanchandani, "Power Electronics", 2nd edition, Tata Mc-Graw Hill Publishing company, 2009.

REFERENCE BOOK:

1. B K Bose, "Power Electronic Control of AC drives", 1st edition, 2005.
2. Ned Mohan, "Power Electronics", 2nd edition, Wiley, 1995.
3. C.W Lander, "Power Electronics", 3rd edition, Mc-Graw Hill, 1993.
4. M.H.Rashid, "Power Electronics: Circuits, Devices and Applications", 3rd edition, Prentice Hall of India, 2009.