

ELECTRIC DRIVES-I

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P

WA/RA	SA	SSH	S	BS

Course Description and Objectives:

This course deals with the basics understanding of main principles of DC drives, various modes of operation, control from converters and choppers

Course Outcomes:

Upon successful completion of this course, the student should be able to:

- Select and implement the drives for industrial processes.
- Design scalar control drive for industrial application.
- Implement various variable speed drives in electrical energy conversion systems.

SKILLS ACQUIRED:

- ✓ Able to select a drive for a particular application.
- ✓ Able to operate the drive in any quadrant.
- ✓ Able to improve the performance of drive.
- ✓ Able to analyze the effectiveness of different control techniques.

ACTIVITIES:

1. Simulate single phase converter fed DC drive using PWM technique.
2. Simulate three phase converter fed DC drive using SPWM technique.
3. Controlling the speed of DC motor using Ward Leonard technique.
4. Simulate chopper fed DC drive with dynamic braking.

UNIT – I **L- 10**

Modeling of DC Machines: Theory of operation-Equivalent Circuit and Electromagnetic Torque-Electromechanical Modeling-State space modeling-Block diagram and Transfer functions

UNIT – II **L- 10**

Single Phase Controlled Converter DC Motor Drives: Principle of DC Motor Speed Control-Armature control-Field Control-armature and field controls. Single –phase semi converter and single-phase full converter fed Separately excited DC motor- for continuous and discontinuous modes of operation-Problems

UNIT – III **L- 10**

Three Phase Controlled Converter DC Motor Drives: Three-phase semi converter and three-phase full converter Separately excited DC motor for continuous and discontinuous modes of operation-Problems-Four Quadrant Operation using Dual Converters-Control modeling of three-phase converter-Two quadrant Three Phase Converter Controlled DC Motor Drive- Transfer Functions of the subsystems

UNIT – IV **L- 10**

Design of Controllers: Current controller-First order Approximation of Inner Current Loop-speed controller-Simulation of one quadrant DC Motor Drive-The Motor equations-filet in the speed feed back loop-Speed Controller- Current Reference Generator-Current Controller-Flow Chart for Simulation.

UNIT – V **L- 10**

Chopper controlled DC Motor drives: Principle of operation of the chopper – four quadrant chopper circuit – chopper for inversion – chopper with other power devices –model of the chopper – input to the chopper – steady state analysis of chopper controlled DC motor drives – rating of the devices - Closed loop operation of DC Motor drives- Speed controlled drive system current control loop – pulse width modulated current controller – hysteresis current controller – modeling of current controller – design of current controller

TEXT BOOKS:

1. G.K, Dubey, "Power semiconductor controlled Drives", Prentice Hall international, New Jersey, 1989.
2. R.Krishnan, "Electric motor drives modeling, analysis and control", PHI-India-2009.

REFERENCES:

1. G. K. Dubey – Fundamentals of electric Drives, Narosa Publishing House, 2nd edition, 2011.
2. W. Leonhard – Control of Electrical drives, Springer, 3rd edition, 2001.
3. P.C. Krause – Analysis of Electric Machine, Wiley-IEEE press 3rdedition.
4. B. K. Bose – Modern Power Electronics and AC Drives, Prentice Hall publication, 1st edition, 2001.