SOLID STATE CONTROL OF DC DRIVES

Course Code:13EE2202 **L P C**

4 0 3

Pre requisites: Power Electronics and Power Electronic Drives

Course Educational Objectives:

The Student shall be exposed to Control of DC Drives and Modelling & Simulation of DC Drives with different Controllers.

Course Outcomes:

After Completion of the Course, the Student will be able to

1. Describe the electric drive, torque equation, load torque components and their classification
2. Analyze 1Φ and 3Φ Converter fed drives.
3. Analyze the Two Quadrant and Four Quadrant Control of DC Motor Drive.
4. Analyze the speed control of chopper Fed drives.
5. Simulate the speed control of DC Motor drives.

UNIT-I

AN INTRODUCTION TO ELECTRICAL DRIVES& DYNAMICS OF ELECTRICAL DRIVES: Electrical drives, Advantages of Electrical Drives, Parts of Electrical Drives, choice of electrical drives, status of dc and ac drives. Fundamental torque equation, speed torque conventions and multi quadrant operation, equivalent values of drive parameters, components of load torques, nature and classifications of load torques, steady state stability.

UNIT-II

CONTROLLED RECTIFIER 1 PHASE AND 3 PHASE FED DC DRIVES:

Introduction, Fully Controlled Rectifier Drives, Single phase fully controlled rectifier control of DC separately excited motor-Discontinuous current-continuous current, Single phase half controlled rectifier control of DC separately excited motor Discontinuous current- continuous current. Three phase semi converter and three phase full converter control of a separately excited DC motor for continuous and discontinuous modes of operation power and power factor Addition of Free-wheeling diode Three phase dual converter control of separately excited DC motor

UNIT-III

CLOSED LOOP CONTROL OF PHASE CONTROLLED DC MOTOR DRIVES &Two-Quadrant three phase converter controlled DC motor drive, Four quadrant DC motor drive, Transfer Functions of the subsystem-DC motor and load-converter-current and speed controllers-current feedback-speed feedback.

UNIT-IV

CHOPPER CONTROLLED DC MOTOR DRIVES & CLOSED LOOP CONTROL OF CHOPPER FED 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, Ratings of the devices. Speed controlled drive system, Current control loop, Pulse width modulated current controller, Hysteresis current controller, modeling of current controller, Design of current controller.

UNIT-V

SIMULATION OF DC MOTOR DRIVES: Dynamic simulations of the speed controlled DC motor drives, Speed feedback speed controller, and command current generator current controller.

TEXT BOOKS:

1. G. K. Dubey, "*Fundamentals of Electric Drives*", Narosa Publications, 1995, 2nd Edition. (Chapters 1,2)
2. R. Krishnan, "*Electric Motor Drives Modeling, Analysis and Control*", Prentice Hall India Publications, 2008. (Chapters 3,4,5)

REFERENCE BOOKS:

1.Shepherd, Hulley, Liang, "*Power Electronics and Motor Control*", 2nd Edition., Cambridge University Press,2004.

2. M. H. Rashid, "*Power Electronic Circuits, Devices and Applications*", 3rd edition, PHI Publications, 2008.

3. G. K. Dubey, "*Power Semiconductor drives*", Prentice Hall India Publications, 1989-01.

4. P. K. Sen, "*Electrical drives*", Prentice Hall India Publications,