

EE701PC: POWER SEMICONDUCTOR DRIVES**B.Tech. IV Year I Sem.**

L	T	P	C
4	1	0	4

Prerequisite: Power Electronics & Electrical Machines – I, II**Course Objectives:**

- To introduce the drive system and operating modes of drive and its characteristics
- To understand Speed – Torque characteristics of different motor drives by various power converter topologies
- To appreciate the motoring and braking operations of drive
- To differentiate DC and AC drives

Course Outcomes: After completion of this course the student is able to

- Identify the drawbacks of speed control of motor by conventional methods.
- Differentiate Phase controlled and chopper controlled DC drives speed-torque characteristics merits and demerits
- Understand Ac motor drive speed–torque characteristics using different control strategies its merits and demerits
- Describe Slip power recovery schemes

UNIT – I

Control of DC motors by single phase and three phase converters: Introduction to Thyristor controlled Drives, Single Phase semi and Fully controlled converters connected to d.c separately excited and d.c series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed d.c motors.

Three phase semi and fully controlled converters connected to d.c separately excited and d.c series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

UNIT – II

Four quadrant operation of DC drives: Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic, and Regenerative Braking operations. Four quadrant operation of D.C motors by single phase and three phase dual converters – Closed loop operation of DC motor (Block Diagram Only)

Control of DC Motors by Choppers: Single quadrant, Two quadrant and four quadrant chopper fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – Speed and torque expressions – speed-torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation (Block Diagram Only)

UNIT - III

Control of Induction Motor Through Stator Voltage And Stator Frequency: Variable voltage characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics.

Variable frequency characteristics-Variable frequency control of induction motor by Voltage source and current source inverter and cyclo converters- PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – numerical problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only)

UNIT – IV

Rotor Side Control of Induction Motor: Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics – advantages, applications, problems.

UNIT –V

Control of Synchronous Motors: Separate control and self control of synchronous motors – Operation of self controlled synchronous motors by VSI, CSI and cyclo converters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control - Cyclo converter, PWM based VSI& CSI.

Text Books:

1. “G K Dubey”, Fundamentals of Electric Drives, CRC Press, 2002.
2. “Vedam Subramanyam”, Thyristor Control of Electric drives, Tata McGraw Hill Publications, 1987.

Reference Books:

1. “S K Pillai”, A First course on Electrical Drives, New Age International (P) Ltd. 2nd Edition. 1989
2. “P. C. Sen”, Thyristor DC Drives, Wiley-Blackwell, 1981
3. “B. K. Bose”, Modern Power Electronics, and AC Drives, Pearson 2015.
4. “R. Krishnan”, Electric motor drives - modeling, Analysis and control, Prentice Hall PTR, 2001