

**POWER SEMICONDUCTOR DRIVES****Professional Elective-II****III Year B.Tech. II-Sem**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
<b>23EC607</b>	<b>PE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>3</b>	<b>CIE</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>		<b>40</b>	<b>60</b>	<b>100</b>
<b>Contact Classes: 48</b>	<b>Tutorial Classes: 0</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 48</b>		

**Prerequisite:** Power Electronics, Electrical Machines – I, Electrical Machines – 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 and 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 and describe Slip power recovery schemes
- Analyze and compare the speed control methods of DC motors, including phase-controlled converters and chopper-controlled drives
- Explain the speed-torque characteristics and control strategies of AC motor drives

**UNIT-I: Control of DC Motors :** Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to DC separately excited and DC series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed DC motors.

Three phase semi and fully controlled converters connected to DC separately excited and DC 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:** 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. 2<sup>nd</sup> Edition. 1989
2. "P. C. Sen", Thyristor DC Drives, Wiley-Blackwell, 1981