IV B.Tech – I Semester
(20EE7326) POWER ELECTRONIC CONTROLS OF DRIVES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisite: Power Electronics and DC Machines, Synchronous and Asynchronous machines

Course Objectives

1. To learn the fundamentals of electric drive and different electric braking methods.
2. To analyze the operation of three phase converter-controlled DC motors and four quadrant operation of dc motors using dual converters.
3. To discuss the converter control of dc motors in various quadrants.
4. To understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
5. To learn the principles of static rotor resistance control and various slip power recovery schemes
6. To understand the speed control mechanism of synchronous motors

Syllabus

Unit – 1: Fundamentals of Electric Drives

Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods: Dynamic – Plugging – Regenerative methods.

Unit – 2: Controlled Converter Fed DC Motor Drives

1-phase half and fully controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics — Principle of operation of dual converters and dual converter fed DC motor drives -Numerical problems.

Unit – 3: DC–DC Converters Fed DC Motor Drives

Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excited motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics –Four quadrant operation – Closed loop operation.

Unit – 4: Stator side and rotor side control of 3-phase Induction motor Drive

Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – Closed loop v/f control of induction motor drives Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages –Applications.

Unit – 5: Control of Synchronous Motor Drives

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives– Variable frequency control–Pulse width modulation.

Course Outcomes

S. No	Course Outcomes	BTL
1.	Understand the fundamentals of electric drives and different electric braking methods	L1
2.	Analyze the operations of three phase converters fed DC motors and four quadrant operations of DC motors using dual converters.	L3
3.	Describe the converter control of DC motors in various quadrants of operations.	L4
4.	Differentiate the stator side control and rotor side control of 3 phase induction motor. And also understand the concept of speed control of induction motor by using AC voltage controllers	L3
5.	Understand the speed control mechanism of synchronous motor drives	L2

Correlation of COs with POs& PSOs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO 1	3	3											3	2
CO 2	3	3	1	1									3	3
CO 3	3	3	1	1									3	2
CO 4	3	3	1	1									3	2
CO 5	3	2	1	1									3	2

1 – Weak, 2 – Moderate and 3 - Strong

Text Books:

1. Fundamentals of Electric Drives – by GK Dubey Narosa Publications
2. Power Semiconductor Drives,by S.B.Dewan,G.R.Slemon,A.Straughen,Wiley India Edition.

Reference Books:

1. Electric Motors and Drives Fundamentals, Types and Applications, by Austin Hughes and Bill
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications.
3. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier.