

B.Tech IV Year I Semester**JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA****19AEE72- POWER SEMICONDUCTOR DRIVES**

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Course Objectives: The objectives of the course are to make the students learn about

- Learn the Control of DC motors by phase controlled converters Analyze controlled rectifier circuits.
- Learn the four Quadrant operation of DC drives
- Learn the control of DC motors by choppers
- Learn the control of Induction motors
- Learn the control of Synchronous motors

UNIT – I: Control of DC Motors By Phase Controlled Converters**10 Hrs**

Introduction to Thyristor Controlled Drives, Single Phase, Three 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.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Control of DC series motors by phase controlled converters **L1**
- Understand the Control of separately DC motors by phase controlled converters **L2**

UNIT – II: Four Quadrant Operation of DC Drives**10 Hrs**

Introduction to Thyristor Controlled Drives, Single Phase, Three 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.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the four Quadrant operation of DC series motor drives **L1**
- Learn about the four Quadrant operation of separately excited DC motor drives **L2**

UNIT – III: Control of DC Motors By Choppers**10 Hrs**

Single Quadrant, Two –Quadrant and Four Quadrant Chopper Fed DC Separately Excited and Series Excited Motors – Continuous Current Operation – Output Voltage and Current Wave Forms – Speed Torque Expressions – Speed Torque Characteristics – Problems on Chopper Fed D.C Motors – Closed Loop Operation (Block Diagram Only)

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the control of DC series motors by choppers **L1**
- Learn the control of separately excited DC motors by choppers **L2**

UNIT – IV: Control of Induction Motors**10 Hrs**

Stator Voltage Control - Variable Voltage Characteristics-Control of Induction Motor by AC Voltage Controllers – Waveforms – Speed Torque Characteristics - Stator Frequency Control - 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) - Static Rotor Resistance Control – Slip Power Recovery – Static Scherbius Drive – Static Kramer Drive –Performance and Speed Torque Characteristics – Advantages-Applications – Problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the stator control of Induction motors L1
- Understand the rotor control of Induction motors L2

UNIT – V: Control of Synchronous Motors

10 Hrs

Separate Control & Self Control of Synchronous Motors – Operation of Synchronous Motors by VSI and CSI 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, VFI, CSI.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the VSI and CSI control of Synchronous motors L1
- Understand the Cyclo converter control of Synchronous motors L2

Text Books:

1. Power semiconductor controlled drives by G K Dubey Prentice Hall
2. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI.

Reference Books:

1. Power Electronics – MD Singh and K B Khanchandani, Tata – McGraw-Hill Publishing company, 1998
2. Modern Power Electronics and AC Drives by B.K.Bose, PHI.
3. Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications.
4. A First course on Electrical Drives – S K Pillai New Age International (P) Ltd. 2nd Edition.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the Control of DC motors by phase controlled converters Analyze controlled rectifier circuits. L1
- Understand the four Quadrant operation of DC drives L2
- Understand the control of DC motors by choppers L3
- Understand the control of Induction motors L4
- Understand the control of Synchronous motors L5