SOLID STATE CONTROL OF AC DRIVES

Course Code: 13EE2211   **L P C**
                                                           4 0 3

Pre requisites: Power Electronics and Power Electronics fed Drives

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

CO1: Explain the Operation of induction motor and analyze speed control of AC Drives by VSI fed drives

CO2: Analyze speed control of AC Drives by CSI fed drives and by slip power recovery drives

CO3: Analyze vector control of Induction motors

CO4: Analyze various control schemes to control speed of synchronous motor drives

CO5: Analyze various control schemes to control speed of PMSM drives and VRM Drives

UNIT-I
INTRODUCTION & VOLTAGE SOURCE INVERTER FED INDUCTION MOTOR DRIVES: Review of steady-state operation of Induction motor, Equivalent circuit analysis, torque-speed characteristics. Scalar control- Voltage fed Inverter control-Open loop volts/Hz control-Speed control with slip regulation-Speed control with torque and Flux control-Current controlled voltage fed Inverter Drive.

UNIT-II
CURRENT SOURCE INVERTER FED INDUCTION MOTOR DRIVES & SLIP POWER RECOVERY SCHEMES: Current-Fed Inverter control-Independent current and frequency control-Speed and flux control in Current-Fed Inverter drive-Volts/Hz control of Current-Fed Inverter drive-Efficiency optimization control by flux program, Slip Power Recovery Drives-Static Kramer Drive-Phasor Diagram-Torque Expression-Speed Control of Kramer Drive-Static Scherbius Drive-Modes of Operation.

UNIT-III
VECTOR CONTROL OF INDUCTION MOTOR: Principles of vector control, Direct vector control, derivation of indirect vector control, implementation block diagram; estimation of flux, flux weakening operation.

UNIT-IV
CONTROL OF SYNCHRONOUS MOTOR DRIVES: Synchronous motor and its characteristics- Control strategies Constant torque angle control- power factor control, constant flux control, flux weakening operation, Load commutated inverter fed synchronous motor drive, motoring and regeneration, phasor diagrams.

UNIT-V
PMSM DRIVES & VARIABLE RELUCTANCE MOTOR DRIVE: Characteristics of permanent magnet, synchronous machines with permanent magnet, vector control of PMSM- Motor model and control scheme. Variable Reluctance motor drives- Torque production in the variable reluctance motor -Drive characteristics and control principles Current control variable reluctance motor servo drive

TEXT BOOK:
1. B. K. Bose, "*Modern Power Electronics and AC Drives*", Pearson Publications- 2008. (Chapter 1,2)

2. R. Krishnan, "*Electric Motor Drives Modeling, Analysis &control*", Pearson Education, 2008. (Chapter 3,4,5)

REFERENCE BOOKS:
1. MD Murphy & FG Turn Bull "*Power Electronics control of AC Motors*" Pergman Press, 1st Edition, 1998.

2. G.K. Dubey" *Fundamentals of Electrical Drives*", Narosa Publications, 1995.

3. G.K. Dubey, "*Power Semiconductor drives*", Prentice hall.