SOLID STATE CONTROL OF AC DRIVES

Course Code: 15EE2211

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Prerequisites: Power Electronics and Power Electronics & 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 vector control of PMSM drives

UNIT-I (10-Lectures)

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 (10-Lectures)

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 (10-Lectures)

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 (10-Lectures)

CONTROL OF SYNCHRONOUS MOTOR DRIVES:

Synchronous motor and its characteristics- Control strategies: Constant torque angle control-power factor control, constant flux control, torque per ampere control, Load commutated inverter fed synchronous motor drive, motoring and regeneration, phasordiagrams.

UNIT-V (10-Lectures)

PMSM DRIVES:

Characteristics of permanent magnet, synchronous machines with permanent magnet, vector control of PMSM- Motor model and Drive system schematics

TEXTBOOK:

1. B. K. Bose, "*Modern Power Electronics and AC Drives*", Pearson Publications- 2008. (Unit -1,2)
2. R. Krishnan, "*Electric Motor Drives Modeling, Analysis & control*", Pearson Education, 2008. (Chapter3,4,5)

REFERENCEBOOKS:

1. MD Murphy & FG Turn Bull "*Power Electronics control of AC Motors*", Pergman Press, 1stEdition, 1998.
2. G. K. Dubey, "*Fundamentals of Electrical Drives*", Narosa Publications, 1995.
3. G.K.Dubey, "*Power Semiconductor drives*", Prenticehall.