ELECTRIC DRIVES-II

Hours Per Week :

L	T	P	C
3	-	2	5

WA/RA	SA	SSH	S	BS

Course Description and Objectives:

This course deals with the introduction on operation and performance of Induction motor, Synchronous motor and brushless DC motor and their speed control technique.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

a. Derive dynamic model of ac motor.
b. Compare scalar and vector control of induction motor.

SKILLS ACQUIRED:

- ✓ Able to reduce the rotor copper losses using slip power recovery scheme.
- ✓ Able to design a speed controller for induction motor.
- ✓ Able to design a speed controller for synchronous motor.
- ✓ Able to choose a drive for different industrial applications.

ACTIVITIES:

1. Design of VFD for irrigation application.
2. Simulate open loop v/f control of induction motor.
3. Simulate Static Scherbius and Kramer drive.
4. Simulate sensorless vector control of induction motor.

UNIT – I **L- 10**

AC Machines for Drives: Induction Machines- torque production – equivalent circuit analysis – speed torque characteristics with variable voltage operation, variable frequency operation, constant v/f operation – variable stator current operation – induction motor characteristics in constant torque and field weakening regions.

UNIT – II **L- 10**

Control and Estimation of Induction Motor Drives : Scalar control voltage fed inverter control- open-loop volts/Hz control-speed control slip regulation – speed control with torque and flux control current controlled voltage fed inverter drive – 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 -Slip power recovery drives – static Kramer Drive – Phasor diagram- torque expression – speed control of a Kramer Drive – Static Scherbius Drive –modes of operation.

UNIT – III **L- 10**

Vector or Field Oriented Control of Induction motor drives: DC Drive analogy-Principles of Vector control-vector control methods – direct vector control –Introduction to DTC.

UNIT – IV **L- 10**

Control and Estimation of synchronous motor drives: Synchronous motor and its characteristics – control strategies – constant torque angle control-unity power factor control constant mutual flux linkage control- Flux weakening operation – maximum speed – direct flux weakening algorithm – constant torque mode controller – flux weakening controller – indirect flux weakening –maximum permissible torque – speed control scheme – implementation strategy – speed controller design.

UNIT – V **L- 10**

Brushless DC motor drives: Three-phase full wave brush less dc motor – sinusoidal type of brush less dc motor – current controlled blushless dc motor servo drive.

TEXT BOOKS:

1. R. Krishnan, “Electric Motor Drives, Modeling, Analysis & control”, Prentice Hall of India.

2. B. K. Bose, “Modern Power Electronics and AC drives”, Prentice Hall of India.

REFERENCES:

1. Boldea & S.A.Nasar, “Electric Drives”, Taylor & Francies.
2. Vedan Subrahmanay, “Electric drives, concepts & Applications”.
3. A. Hamid Toliyat and Steven Campbell, “DSP based Electromechanical Motion Control”, By, CRC Press, 2004.