

## **EE8009 CONTROL OF ELECTRICAL DRIVES**

### DETAILED SYLLABUS

#### **OBJECTIVES:**

To impart knowledge about the following topics:

- To understand the DC drive control.
- To study and analyze the Induction motor drive control.
- To study and understand the Synchronous motor drive control.
- To study and analyze the SRM and BLDC motor drive control.
- To analyze and design the Digital control for drives.

#### **UNIT I CONTROL OF DC DRIVES**

Losses in electrical drive system, Energy efficient operation of drives, block diagram/ transfer function of self, separately excited DC motors --closed loop control-speed control current control - constant torque/power operation - P, PI and PID controllers--response comparison.

#### **UNIT II CONTROL OF INDUCTION MOTOR DRIVE**

VSI and CSI fed induction motor drives-principles of V/f control-closed loop variable frequency PWM inverter with dynamic braking- static Scherbius drives- power factor considerations-- modified Kramer drives-principle of vector control- implementation-block diagram, Design of closed loop operation of V/f control of Induction motor drive systems.

#### **UNIT III CONTROL OF SYNCHRONOUS MOTOR DRIVES**

Open loop VSI fed drive and its characteristics--Self-control--Torque control --Torque angle control --Power factor control--Brushless excitation systems--Field oriented control -- Design of closed loop operation of Self-control of Synchronous motor drive systems.

#### **UNIT IV CONTROL OF SRM AND BLDC MOTOR DRIVES**

SRM construction - Principle of operation - SRM drive design factors-Torque controlled SRM-Block diagram of Instantaneous Torque control using current controllers and flux controllers. Construction and Principle of operation of BLDC Machine -Sensing and logic switching scheme -Sinusoidal and trapezoidal type of Brushless dc motors -- Block diagram of current controlled Brushless dc motor drive.

#### **UNIT V DIGITAL CONTROL OF DC DRIVE**

Phase Locked Loop and micro-computer control of DC drives--Program flow chart for constant constant torque and constant horse power operations Speed detection and current sensing circuits and feedback elements.

#### **TEXT BOOKS:**

1. Dubey, G.K, Power semiconductor-controlled devices, Prentice Hall International New jersey, 1989.

2. R. Krishnan, Electric Motor Drives - Modeling, Analysis and Control Prentice- Hall of India Pvt. Ltd., New Delhi, 2003.

3. Murphy, J.M.D, Turnbull F.G, Thyristor control of AC motors, Pergamon press, Oxford, 1988.

### **REFERENCES**

1. Bin Wu, High-Power Converters and AC Drives, Wiley-IEEE Press

2. Buxbaum, A. Schierau, and K. Staughen, A design of control systems for DC drives, Springer-Verlag, Berlin, 1990.

3. Bimal K. Bose, Modern Power Electronics and AC Drives, Pearson Education (Singapore) Pte. Ltd., New Delhi, 2003.

4. R. Krishnan, Switched Reluctance Motor Drives: Modeling, Simulation, Analysis, Design, and Applications, CRC press, 2001.

5. Werner Leonhard, Control of Electrical Drives, 3rd Edition, Springer, Sept., 2001.

6. R. Krishnan, Permanent Magnet Synchronous and Brushless DC Motor Drives, CRC press, 2001.