Course Name Electric Drives

Course Code EE701

Course Credit 3

Contact Hour 3L

Prerequisite Electrical Machine, Power Electronics

Course Objective

1. To teach the principles of electrical drives.
2. To empower students to understand the dynamics of electrical drives used.
3. To expose the students to the concepts of various types of electrical drives for different types of applications & to choose the power rating.
4. To prepare the students to understand the starting and braking methods of electrical drives.
5. 5.To teach principles of dc motor drives, induction motor drives & synchronous motor drives.

Course Outcome

On completion of the course students will be able to

1. Understand the principle of electrical drives & be able to understand the dynamics of electrical drive systems.
2. Select a drive for a particular application based on power rating & to select a drive based on mechanical characteristics for a particular drive application.
3. Operate and maintain solid state drives for speed control of DC machines
4. Operate and maintain solid state drive for speed control of various special electrical machines.
5. Understand various starting and braking methods on electrical drives including their effects on power supply, motor and load.
6. Learn speed control of induction motor drives in an energy efficient manner using power electronics & be able to learn the control system for synchronous motor drives using power electronics

CO Mapping with departmental POs

H: High, M: Medium, L: Low

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	H	H			H		M					
CO 2	H	H			H		M					
CO 3	H	H	H	H	H		M					
CO 4	H	H	H	H	H		M					
CO 5	H	H	H	H	H		M					
CO 6	H	H	H	H	H		M					

Course Content

Unit I: Electric Drive **5L**

Concept, classification, parts and advantages of electrical dives. Types of Loads, Components of load toques, Fundamental torque equations, Equivalent value of drive parameters for loads with rotational and translational motion. Determination of moment of inertia, Steady state stability, Transient stability. Multiquadrant operation of drives. Load equalization.

Unit II: Motor power rating **5L**

Thermal model of motor for heating and cooling, classes of motor duty, determination of motor rating for continuous, short time and intermittent duty, equivalent current, torque and power

methods of determination of rating for fluctuating and intermittent loads. Effect of load inertia& environmental factors.

Module III: DC motor drives **6L**

Modeling of DC motors**,** State space modeling, block diagram & Transfer function, Single phase, three phases fully controlled and half controlled DC drives. Dual converter control of DC drives. Power factor, supply harmonics and ripple in motor current, chopper controlled DC motor drives.

Module IV: Industrial application **5L**

Introduction to Solar and Battery Powered Drive, Stepper motor, Switched reluctance motor drive, Drive consideration for Textile mills, Steel rolling mills, Cement mills, Paper mills, Machine tools. Cranes & hoist drives.

Module V: **8L**

Starting of Electric Drives

Effect of starting on Power supply, motor and load. Methods of stating of electric motors. Acceleration time Energy relation during stating, methods to reduce the Energy loss during starting.

Braking of Electric Drives:

Types of braking, braking of DC motor, Induction motor and Synchronous motor, Energy loss during braking,

Module VI: Induction motor drives **6L**

Stator voltage variation by three phase controllers, Speed control using chopper resistance in the rotor circuit, slip power recovery scheme. Pulse width modulated inverter fed and current source inverter fed induction motor drive. Volts/Hertz Control, Vector or Field oriented control.

Module VII: Synchronous motor drives **5L**

Variable frequency control, Self Control, Voltage source inverter fed synchronous motor drive, Vector control.

Text Books:

1. Fundamental of Electrical Drives, G.K. Dubey, New Age International Publication.
2. Electric Drives, Vedam Subrahmanyam, TMH
3. A first course on Electrical Drives, S.K. Pillai, , New Age International Publication.

Reference Books:

1. Electric motor drives, R. Krishnan, PHI
2. Modern Power Electronics & Ac drives, B.K. Bose, Pearson Education.
3. Electric Motor & Drives. Austin Hughes, Newnes.