

EE6T4	3/4 B.Tech. SIXTH SEMESTER POWER SEMICONDUCTOR DRIVES	Credits: 3
Lecture: 3 periods/week		Internal assessment: 30 marks
Tutorial: 1 period /week		Semester end examination: 70 marks

Course Objective:

This course is an extension of power electronics applications. It covers in detail the basic and advanced speed control techniques using power electronic converters that are used in industry. It is equally important to understand the four quadrant operation of electric drives and slip power recovery schemes in induction motors.

Course Outcomes:

Upon completing this course students must be able to

1. Learn electric drive system and multi quadrant operation
2. Understand operation of 1 Φ , 3 Φ rectifiers fed Dc motors
3. Understand operation of chopper fed DC motors
4. Know the speed control of converter fed induction motor and synchronous motor
5. Analyze ac machine by linear transformation

UNIT I**Introduction to Electric Drives**

Parts of electric drives, choice of electric drives, fundamental torque equation, multi quadrant operation, equivalent values of drive parameters.

UNIT II**Control of DC Motors by phase converters**

Control rectifier fed dc drives, single phase fully controlled rectifier control, single phase half controlled rectifier control of dc separately excited motor, rectifier control of dc series motor
Three phase fully controlled rectifier control, three phase half controlled rectifier control of dc separately excited motor, multi quadrant operation of separately excited motor fed from fully controlled rectifier, supply harmonics, power factor and ripple in motor current.

UNIT III**Control of DC Motors by Choppers**

Introduction to four quadrant operation, motoring, braking (types of braking), single quadrant, two quadrant and four quadrant chopper fed dc separately excited, series motor-continuous current operation and speed-torque characteristics. Four quadrant operation of dc motors by dual converters. Closed loop speed control of dc motor (block diagram only)

UNIT IV**Control of Induction Motors**

Stator voltage control- variable frequency control from voltage sources, VSI fed induction motor drives, cascaded H-bridge 5 level inverter fed induction motor (principle of operation only), cyclo-converter control(principle of operation only),variable frequency control for current source inverter, rotor resistance control, slip power recovery schemes-static scherbius, static Kramer drive.

UNIT V**Linear transformation of AC machines**

Introduction, transformation from three phases to two phases and vice versa, transformation from rotating axes to stationary axes, physical concepts of park's transformation. Introduction to vector control and direct torque control, introduction to heat dissipation.

Learning Resources

Text Books:

1. Fundamentals of Electric Drives by G K Dubey ,Narosa Publications.
2. Power electronics and Motor control by W.Shepherd, L.N. Hulley and D.T.W.Liang – 2nd edition, 1995, Cambridge University Press
3. Generalized theory of electrical machines by Dr.P.S.Bhimbhra,khanna publications, 5th edition.

Reference Books:

1. Thyristor Control of Electric drives by Vedam Subramanyam, Tata McGraw Hill Publications.
2. A First course on Electrical Drives,S K Pillai ,New Age International (P) Ltd. 2nd edition
3. Power Electronics – M.D. Singh and K.B. Khanchandani , Tata Mc Graw Hill Publishing company,1998.