

GUJARAT TECHNOLOGICAL UNIVERSITY

Power Electronics

B. E. SEMESTER: VI

Subject Name: **Industrial Drives and Control-I**

Subject Code: **162404**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
3	0	2	5	70	30	50

Sr. No.	Course Contents	Total Hrs
1.	Introduction: <ul style="list-style-type: none">• History Of Dc Drive -Electronic Control -Solid State Control• State Of Art Of Dc Drive• Block Diagram Of Drive - Part Of Electrical Drive	03
2.	Dc Motors Fundamentals and Mechanical Systems: <ul style="list-style-type: none">• DC motor- Types, induced emf, speed-torque relations; Speed control – Armature and field speed control; Ward Leonard control – Constant torque and constant horse power operations• Characteristics of mechanical system – dynamic equations, components of torque, types of load; Requirements of drives characteristics – multi-quadrant operation; Drive elements, types of motor duty and selection of motor rating	08
3.	Converter Control: <ul style="list-style-type: none">• Principle of phase control – Fundamental relations• Analysis of series and separately excited DC motor with single-phase and three-phase converters – waveforms, performance parameters, performance characteristics• Continuous and discontinuous armature current operations• Current ripple and its effect on performance• Operation with freewheeling diode, Implementation of braking schemes• Four Quadrant operation of DC Drive-Drive employing dual converter- Advantage and Disadvantage of Dual Converter with & without Circulating Current	08

4.	Chopper Control : <ul style="list-style-type: none"> • Chopper controlled DC motor – performance analysis, multi-quadrant control • Chopper based implementation of braking schemes • Multi-phase chopper-Reversible Drive- Selection of Drive for speed reversal • Traction Drive using semiconductor converter controlled DC motors 	06
5.	Closed Loop Control: <ul style="list-style-type: none"> • Modelling of drive elements – Equivalent circuit, transfer function of self, separately excited DC motors, Linear Transfer function model of power converters, Sensing and feeds back elements • Closed loop speed control – inner current controlled loops, Current limit and speed loops, P, PI and PID controllers – response comparison, Closed loop armature control using field weakening • Four quadrant closed loop speed control with armature reversal- Simulation of converter and chopper fed DC Drive using MATLAB 	08
6.	Digital Control of Dc Drive: <ul style="list-style-type: none"> • Phase Locked Loop and micro-computer control of DC drives • Program flow chart for constant horse power and load disturbed operations • Speed detection and gate firing 	06
7.	Special Machine Drive & Servo Drive: <ul style="list-style-type: none"> • Introduction – permanent magnet motor drive – Control and Implementation • Servo motor drive requirement – control and implementation 	03

Text Book:

1. Power Semiconductor controlled Drives, Gopal K Dubey

Reference Books:

1. Electric Motor Drives – Modeling, Analysis and Control, R.Krishnan
2. Fundamentals of Electrical Drives, Gopal K.Dubey
3. Thyristorised DC Drives, P.C Sen
4. Power Semiconductor Drives, S.Sivnagaraju