

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E.in Power Electronics & Electrical Drives

Semester: I

Subject Name: **Solid State DC Drives**
 Subject Code: **714502**

Sr. No	Course Content
1	DC MOTORS FUNDAMENTALS AND MECHANICAL SYSTEMS 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.
2	CONVERTER CONTROL 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; Drive employing dual converter.
3	CHOPPER CONTROL Introduction to time ratio control and frequency modulation; Class A, B, C, D and E chopper controlled DC motors – performance analysis, multi-quadrant control - Chopper based implementation of Braking schemes; Multi-phase chopper; Related problems.
4	CLOSED LOOP CONTROL Modeling of drive elements – Equivalent circuit, transfer function of self, separately excited DC motors; Linear Transfer function model of power converters; Sensing and feedback elements Closed loop speed control – current and speed loops, P, PI and PID controllers – response comparison. Simulation of converter and chopper fed DC drive.
5	DIGITAL CONTROL OF D.C DRIVE 9 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.

Reference Books:

1. Gopal K Dubey, "Power Semiconductor controlled Drives", Prentice Hall Inc., New Yersey, 1989.
2. R. Krishnan, "Electric Motor Drives – Modeling, Analysis and Control", Prentice-Hall of India Pvt. Ltd., New Delhi, 2003.
3. Gobal K. Dubey, "Fundamentals of Electrical Drives", Narosal Publishing House, New Delhi, 2001.
4. Bimal K. Bose "Modern Power Electronics and AC Drives", Pearson Education (Singapore) Pte. Ltd., New Delhi, 2003.
5. Vedam Subramanyam, "Electric Drives – Concepts and Applications", Tata McGraw-Hill publishing company Ltd., New Delhi, 2002.
6. P.C Sen. "Thyristor DC Drives", John Wiley and sons, New York, 1981.
7. B. K. Bose – Power Electronics & AC Drives Prentice-Hall, New Jersey.
8. P. Vas – Vector control of ac machines, Clarendon Press, Oxford.
9. G. K. Dubey – Power semiconductor controlled drives, Prentice-Hall, Eaglewood cliffs.
10. T.J.E. Miller – Brushless PM and Reluctance Motor Drives, clarendon Press Oxford.
11. Recent IEEE publication & transactions on power electronics, industry applications and power delivery.