

EE 530: ELECTRIC DRIVES & CONTROL (3-0-0: 3)

Review of Conventional Drives

Speed –torque relation, Steady state stability, methods of speed control & braking for DC motor – Multi quadrant operation, Speed torque relation of AC motors, Methods of speed control and braking for Induction motor, Synchronous motor; Criteria for selection of motor for drives.

Converter Control of DC Drives

Analysis of series and separately excited DC motor with single phase and three phase controlled rectifiers operating in different modes and configurations.

Analysis of series and separately excited DC motors fed from different choppers for both time ratio control and current limit control, four quadrant control. Single quadrant variable speed chopper fed DC drives. Four quadrant variable speed chopper fed DC Drives.

Single phase/ three phase - dual converter fed DC Drive, current loop control, Armature current reversal, Field current control, Different controllers and firing circuits.

Inverter fed AC Drives

Analysis of different AC motor with single phase and three phase inverters Operations in different modes and configurations.

Cyclo-Converter fed AC Drives

Analysis of different AC motor with single phase and three phase cyclo-converters Operations in different modes and configurations. Vector Control and Rotor side Control.

AC Voltage Controller fed AC Drives

Speed Control and braking, Analysis of different AC motor with single phase and three phase ac voltage controllers. Operations in different modes and configurations.

Control and Estimation of AC drives

Induction motor: Small signal models, scalar control, FOC control, sensor less control, DTC, adaptive control. Synchronous motor: sin SPM, synchronous reluctance machines, sin IPM machines, trapezoidal SPM, wound fitted SM, sensor-less operation, switched reluctance machines, Dynamics and Modeling of AC Drives.

Text Books and References

1. M. H. Rashid, "Power Electronics - Circuits, Devices and Applications", P.H.I Private Ltd. New Delhi.
2. B. K Bose, " Modern Power Electronics and AC Drives" PHI
3. G.K. Dubey "Power Semiconductor controlled drives", Prentice Hall inc, A division of Simon and Schester England cliffs, New Jersey.
4. Sheperal, L.N. Wand Hully, "Power Electronic and Motor control" Cambridge University Press Cambridge.
5. S. Dewan, B. Slemmon, A.G.R Straughen, "Power Semiconductor drives", John Wiley and Sons, NewYork.
6. P.C. Sen, "Thyristor DC Drives", John Wiley and sons, NewYork.
7. V. Subramanyam, "Electric Drives – Concepts and applications", Tata McGraw Hill Publishing Co., Ltd., New Delhi.

8. B.K. Bose, "Power Electronics and Variable frequency drives", Standard Publishers Distributors, New Delhi.
9. J.M.D. Murphy and F.G. Turnbull, "Thyristor control of AC motor", Pergamon press, Oxford.
10. N. Mohan et.al. "Power Electronics- Converters, Applications and Design", John Wiley & Sons (Asia) Private Ltd.
11. R. Krishnan, "Electric motor drives: modeling, analysis and control", Pearson.