I Year II Semester	L	P	C
Code: 17PE202	4	0	3

POWER ELECTRONIC CONTROL OF AC DRIVES
(Common to PE, P&ID, PE&ED, PE&D, PE&S, EM&D, PE&PS)

Perquisites: Concepts of power electronics, electrical machines and closed loop control.

Course Educational Objectives:

- To analyses the VSI fed induction motor drive.
- To study the performance of different types of BLDC motor drives.
- To study different traction drives.
- To know the operation and control of switched reluctance motor & stepper motor.

UNIT-I: 3-phase induction motor drives – Part 1

Analysis of IM fed from non-sinusoidal supply, harmonic equivalent circuit, transient analysis – starting and plugging; variable frequency control, torque-slip relation, starting torque and braking torque, closed-loop VSI fed IM drive. Slip-ring IM control, closed-loop speed control with static rotor resistance, closed-loop speed control by using slip power recovery scheme.

UNIT-II: 3-phase induction motor drives – Part 2

Concept of space vector, vector control of IM: direct or feed-back vector control, flux vector estimation, indirect or feed forward vector control, vector control of line side PWM converter, stator flux oriented vector control, vector control of converter fed inverter drive.

UNIT-III: Synchronous motor and BLDC motor drives

Variable frequency control of synchronous motor, closed-loop control of inverter fed synchronous motor drive. Permanent magnet synchronous motor drive. BLDC motor drives, VSI fed BLDC motor drives, back emf, phase current and torque waveforms, control of BLDC motors with sensors, sensor-less control of BLDC motors.

UNIT-IV: Traction drives

Motors employed in railway traction and road-vehicles, control of railway traction dc motors using ac-dc converters, control of railway traction ac motors using ac-dc and dc-ac converters, power electronic control circuits of electric vehicles and hybrid electric vehicles.

UNIT-V: Switched reluctance and stepper motor drives

Switched reluctance motor operation and control: modes of operation, converter circuits closed loop speed control. Stepper motor characteristics drive circuits for uni-polar and bipolar stepper motors.

Course Outcomes:
After completion of this course the students will be able to:

- Explain operation of induction motor and analyses speed control of AC drives by VSI fed drives.
- Understand vector control of induction motors.
- Understand operation of traction drives.
- Analyses control schemes to synchronous motor drives.
- Understand control of switched reluctance motor & stepper motor.

Reference Books:
1. "Electric motor drives, modeling, analysis and control", R. Krishnan, PHI Publishers
2. "Control of electric drives", W. Leonhard, Springer Verilog
3. "Vector control of AC machines", ArindamGhosh, Gerard Ledwich
4. "Power Electronics: Converters, Application and design", Mohan, Undeland and Robbins, Wiley Publications.
5. "Urban transport and hybrid electric vehicles", Edited by SerefSoylu, Published online, 18 Aug 2010. Available:http://www.intechopen.com/books/urban-transport-and-……...
6. "Power control of AC motors", J.M.D. Murphy and F. G. Turnbul
7. "Power semiconductor drives", G. K. Dubey, Printice Hall International
8. "Fundamentals of electric drives", G. K. Dubey, Narosa Publishing House.