Power Electronics - Video course

Module-1 duration- 2hrs
Introduction: Application of Power Electronics to :

1) Motor control with emphasis on Traction and Industrial Process control
2) Power Supplies - Revolution in Personal Computers UPS
3) Power Transmission - Facts Technology, HVDC
4) Chemical Process
5) Battery charging
6) Power extraction from non-conventional enery sources
7) Automotive electronics
8) High energy physics Evolution of Power Electronics
Days of Mercury arc rectification--forerunner of Power Electronics
Invention of SCR and its impact
Advent of Selfcommutated switches and their impact

Module-2 duration-3hrs
Structure of Power Electronics: How structurally power electronics differs
from low power analog electronics
Different types of switches
Power Diodes: from the viewpoint of an application engineer
SCR: Device structure, Static characteristic, dynamic characteristic constraints of Turn on and Turn off time, different relevant ratings.

Module-3 duration-2hrs
Diode rectifiers Applications: Power Supplies, Front end converter for ac motor drives, battery charger, chemical process
1) Single phase Half wave with R load
2) Single phase Half wave with R-L load
3) Single phase Full bridge rectifier with dc link capacitive filter, issue of harmonics
4) Three phase Full bridge rectifier with dc link capacitive filter, issue of harmonics

Module-4 duration-4hrs
AC to DC controlled converters
Application: DC Motor Drives
Battery chargers
HVDC transmission
1) Single phase fully controlled AC to DC converter
i) Principle of operation: Issue of line commutation
ii) Continuous mode of conduction: expression for average output voltage
iii) Modes of operation in the voltage-current plane
iv) discontinuous mode of conduction
v) analysis with R-L-E load, significance of R-L-E load
vi) operation as an inverter: constraints for line commutation
vii) Dual converter: motivation
Simultaneous and nonsimultaneous control
vii) input displacement factor, distortion factor, harmonics
viii) Effect of source inductance
ix) Requirement of snubber
2) Single phase half controlled converter:
operating principle,
input displacement factor
Modes of operation in the voltage-current plane

NP-TEL

NPTEL

http://nptel.ac.in

Electrical Engineering

Coordinators:

Prof. B.G. Fernandes
Department of Electrical EngineeringIIT Bombay

Prof. Kishore Chatterjee
Department of Electrical EngineeringIIT Bombay

Module-5 duration-1 hrs
Three phase half wave ac to dc converter
Principle of operation
Derivation of o/p voltage
issue of dc magnetization of the input transformer
Module-6 duration-3 hrs
Three phase fully controlled ac to dc converter
Principle of operation
Derivation of average output voltage
Derivation of displacement factor
Inverter mode of operation
Constraints of commutation in inverter mode
Effect of source inductance
Moduel - 7 duration-4 hrs
Limitation of Line commutated converters
Single phase unity powerfactor converter
Principle of switched Power power conversion
Bi-directional Power converters
Module- 8 duration-8 hrs
DC- DC Power Converters
Limitations of Linear Power supplies
Switched Power Power supplies (Buck, Buck-Boost, Boost, Cuk, Fly-back and Forward Convverters)
Transfer fucntion for these converters
Module-9 duration-8 hrs
Motivation
DC- AC Power Converters
Principle of operation of Inverters
Half bridge, full bridge, three phase- six step operation, voltage control, PWM techniques