

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 energy 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

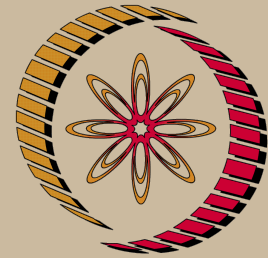
AC to DC controlled converters

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



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Electrical Engineering

Coordinators:

Prof. B.G. Fernandes

Department of Electrical Engineering IIT Bombay

Prof. Kishore Chatterjee

Department of Electrical Engineering IIT 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

Module - 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 Converters)

Transfer function 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