RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VI-Semester

Open Elective EC- 604 (C) POWER ELECTRONICS

Unit-1

Power Semiconductor Switches

Power diodes - Basic structure and V-I characteristics - various types - **DIACs** – Basic structure and V-I characteristics – **TRIACs** - Basic structure and V-I characteristics

Power BJT: Construction and working principle, quasisaturation, primary breakdown, secondary breakdown.

IGBTs - Basic structure and V-I characteristics.

Power MOSFETs - Basic structure and V-I characteristics

Thyristors - basic structure - static and dynamic characteristics - device specifications and ratings - methods of turning on - gate triggering circuit using UJT

Unit 2:

Rectifiers

Thyristors- series and parallel operation, methods of turning off - commutation circuits.

Line frequency phase controlled rectifiers using SCR

Single Phase – Half wave rectifier with R and RL loads – Full wave half controlled and fully controlled converters with continuous and constant currents - Input side harmonics and power factor - Effect of source inductance

Three Phase - Half wave rectifier with R and RL loads - Full wave fully controlled converters with continuous and constant currents

Unit 3: Inverters & Cycloconverters Inverters – Single phase inverters – series, parallel and bridge inverters. Single Phase Pulse Width Modulated (PWM) inverters – Basic circuit and operation.

Single phase series resonant inverter, Single phase bridge inverters,Three phase bridge inverters, Voltage control of inverters, Harmonics reduction techniques, Single phase and three phase current source inverters

Unit-IV

AC Voltage Controllers

Principle of On-Off and phase controls, Single phase ac voltage controller with resistive and inductive loads Three phase ac voltage controllers (various configurations and comparison only), Single phase transformer taps changer. Cyclo Converters-Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation

Unit V: DC – DC Converters

Choppers - Principle of operation - step-up and step-down choppers.

Switching regulators - Buck regulators - Boost regulators - Buck-boost regulators - Switched mode power supply - principle of operation and analysis

Text/Reference Books:

1. Ned Mohan, Power Electronics., John Wiley and Sons, 2nd edition, 1995.

2. Rashid, Power Electronics, Circuits Devices and Applications, Pearson Education, 3rd edition, 2004.

3. G.K.Dubey, Thyristorised Power Controllers, Wiley Eastern Ltd, 1993.

4. Dewan & Straughen, Power Semiconductor Circuits, John Wiley & Sons, 1975.

5. Cyril W Lander, Power Electronics, Mc Graw Hill, 3rd edition, 1993.

6. M.D. Singh and K.B.Khanchandani, "Power Electronics"Tata MC Graw Hill, 2005

7. P.C Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2nd Edition.

8. P.S Bhimbhra , " Power Electronics", Khanna Publishers, 2012