RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Electronics & Communication Engineering, VII-Semester Elective-III

EC- 7004 (2) Power Electronics

COURSE CONTENTS

Unit-I

Advantages and application of power electronic devices characteristics, Symbol &application of power diodes, power transistors, GTO, TRIAC, DIAC, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottkey diode MCTs. Principle of operation of SCR, Two transistor analogy, brief idea of construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR Gate characteristics, Method for turning on of SCR, Turnoff methods, different commutation techniques (Class A,B,C,D,E, & F Commutation) firing of SCR, Resistance firing circuit, Resistance, capacitance firing circuit, UJT firing cut, protection of SCR over voltage, Over current, Superior firing, Design of snubber circuit and protection of gate of SCR, heating, cooling & mounting of SCR.

Unit-II

Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) uncontrolled and controlled rectifier circuit with resistive, resistive& inductive load (continuous & non continuous conduction, inductive loads and RLE loads. Estimation of average load voltage and load current for above rectifier circuits active and reactive power input. Effect of freewheeling diode and source inductance on performance of this rectifier circuits Comparison of mid-point& Bridge rectifier circuits. Power factor correction, simulation and modeling of convertor topologies in Matlab/ Simulink.

Unit-III

Voltage source & current source inverter, Single phase and three phase bridge inverter, self cumulated inverters, Mcmurray & Mcmurray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction techniques. Simulation and modeling of single phase and three phase inverters in Matlab/Simulink.

Unit-IV

Principle of chopper operation, various control strategies in chopper, Step up &step-up/step down choppers, chopper configuration (Type A, B, C, D, & E), Current & voltage commutation of chopper circuits Jones & Morgens chopper. Simulation and modeling of choppers in Matlab/Simulink.

Unit-V

Single phase (midpoint & bridge configuration) and three phase cyclic convertor configuration and operating principles.AC voltage controllers (using SCRs &TRIACs) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis)Switched mode voltage regulator buck, Boost, Buck & Boost, Cuck regulators.

References:

1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson Education, Singapore, 1993.
2. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
3. Shailendra Jain, Modeling and Simulation using Matlab Simulink, Wlley India Pvt. Ltd.
4. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
5. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray &Co.
6. Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.
7. Vedam Subramanyam, Power Electronics New Age International Revised II ed.2006.
8. Randall Shaffer, Fundaments of Power Electronics with MATLAB Cengage Learning 2008