Audit Course-3

Power Electronics and Applications

Unit I : AC-DC power converters

Concept of line & forced commutation, Single phase Semi & Full converters for R, R-L loads, Performance parameters, Effect of freewheeling diode, Three phase Semi & Full converters for R and RL load. Simple triggering circuits for single phase converters, triggering circuit requirement for three phase converters

Unit II : DC-AC Converters

Single phase bridge inverter for R & R-L load using MOSFET / IGBT, performance parameters, single phase PWM inverters. Three phase voltage source inverter for balanced star R load. Control circuits for single phase bridge inverters, control circuit requirement for three phase inverters

Unit III : DC-DC converters & AC Voltage Controller

Working principle of step down chopper for R-L load (highly inductive), control strategies. Performance parameters, Step up chopper, 2-quadrant & 4-quadrant choppers, SMPS, Buck regulator e.g. TPS54160, hysteretic buck regulator e.g. LM3475, Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210, Low Drop out (LDO) Regulators ICs-TPS 7A4901, TPS7A8300; Typical control circuits for single quadrant and two quadrant choppers. Single-phase full wave AC voltage controller with R load.

Unit IV:

a) Resonant converters: Need for resonant converters, Classification, Resonant Switch: ZC resonant switch and ZV resonant switch, Quasi Resonant Converters: ZCS and ZVS, their comparison, Load resonant converters: SLR half bridge DC/DC converter in low frequency.

b) Power Quality: Power Quality considerations, Reactive Power and Harmonic Compensation, Active filters for power conditioning.

Unit V: Power Electronics Applications

ON-line and OFF line UPS with battery AH, back up time, battery charger rating. Electronic ballast: Characteristics of fluorescent lamps and advantages over conventional ballast. Power Electronics in Capacitor Charging Applications. HVDC transmission: Main components of HVDC Converter station, Types of HVDC systems. Universal motor speed control.

Unit VI: Power Electronics for Renewable Energy Sources

Power Electronics for Photovoltaic Power Systems: Basics, Types, Stand-alone PV systems, Grid connected PV systems. Power Electronics for wind power systems: Basics, Types, Standalone wind energy systems, Grid connected wind energy systems, Control of wind turbines.

Text Books

1. M. H. Rashid, “Power Electronics Handbook”, Academic Press, 2001. 2. M. S. Jamil Asgar, "POWER ELECTRONICS", PHI, 2004, New Delhi

Reference Books

1. Ned Mohan, T. Undeland& W. Robbins, “Power Electronics Converters applications and design” 2nd edition, John Willey & sons, Singapore

2. U. R. Moorthi, "POWER ELECTRONICS, DEVICES, CIRCUITS & INDUSTRIAL APPLICATIONS" , Oxford University Press, New Delhi, 2005

3. "GE SCR MANUAL" 6th edition, General Electric, New York, USA

4. Timothy Skvarenina, “The Power Electronics Handbook”, CRC Press, 2002