4143 - POWER ELECTRONICS

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)			
					Theory		Practical Ex.	Total
Lectures	Practical	Credits						
3	2	5	25	25	3 Hrs	100	50	200

Pre-requisite	Source	Semester	Theory	Test	Total	TW	PR	Gr Total
Nil	EXN		75	25	100	25	–	125

Rationale: Power Electronics is the hearth of industrial power control system. Power controls almost all the electronic devices. Therefore this subject introduces the students to basics of solid state thyristors. Students will be able to learn characteristics of thyrisrors and applications in electronic field.

COURSE CONTENTS	Hrs	Mks
1. THYRISTORS	14	30
Silicon controlled rectifier, construction and electrical characteristics. Two-transistor model of SCR. SCR transient characteristic. Silicon control switch and characteristic. LASCR construction and characteristics GTO construction and characteristics. Diac and characteristics. Triac construction and characteristics. Thyristor rating: Anode voltage, current, di/dt and dv/dt. Gate ratings, Gate characteristics with minimum and, maximum power dissipation. Turn on losses di/dt and dv/dt calculation (snubber circuit). Thyristor turn on methods: Characteristics of UJT and PUT. Simple triggering circuits using UJT and PUT. SCR communication, Natural and forced commutation.. Classification of forced commutation – class A, B, C, D, E and F class. Pulse triggering and R.C. triggering for SCR and Triac turn.		
2. RECTIFIER	14	30
Construction of power diode Transient characteristics, Series and parallel operation of diodes. Single phase controlled rectifier circuit with resistive load. Average D.C. voltage and current, RMS values across load. Single phase half wave and full wave controlled rectifier with RL load. Current and voltage waveform. Three Phase half wave and full wave rectifier. Relationship between A.C. and D.C. current & voltage. 3 phase half and full wave A.C. phase controlled rectifier with resistive load. Relationship between I/p and O/P voltage and current.		
3. APPLICATION OF THYRISTORS	16	30
Inverters: Single-phase series inverter. Single-phase parallel inverter. Bridge type Inverter. Mc Murray inverter, Mc Murray Bedford inverter. Chopper: Single thyristor and two-Thyristor chopper. Morgan choppers. Cyclo-converters – Single phase Cycloc-onverters for 25 hertz & 16 2/3 Hertz Power control using Triacs and SCR.for phase control, Triac as a Switch, Triac light dimmer and Triac for starting single-phase motor. AC power control-using SCR.		
4. REGULATORS	4	10
AC regulators – Saturable core reactor, Servo type regulator, SCR Controlled static regulator and 2/3-relay regulator. Block diagram of SMPS and brief explanation.		
Total	48	100

PRACTICALS: (Any 8)

1. AC phase controlled supply. Calculation and comparison of rms values. For different firing angles.
2. SCR power supply. Calculation and comparison of D.C. voltage with respect to firing angles, (CRO) comparison of angles by CRO and WCR.
3. Design of rectifier for given load and ripple factor (including transformer)
4. Design of IC 723 regulator for typical 5 volts and 10 volts D.C. supply.
5. Characteristics of SCR, Triac and Diac.
6. Design of DI/DT and dv/dt circuits.
7. UJT as turn on circuit/ CR turn on circuit.
8. Turn off circuits.
9. Study of inverter.
10. Study of Chopper.
11. Triac light dimmer/Phase controller.
12. PUT as turn on circuit.
13. Design of rectifier and filter circuits including transformer.
14. Design of transistor series regulator.
15. Study of AC regulator, Relay type, SCR static regulator and servo regulator.