

GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRICAL & ELECTRONICS ENGINEERING

B. E. SEMESTER: VII

Subject Name: **Power Electronics and Industrial Drives**

Subject Code: **170801**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
3	0	2	5	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	Power Semiconductor Devices: History of development of Power Electronic devices, Constructional features, Characteristics, rating and specification, gate/base drive circuits, protection including cooling and application consideration of diodes, SCRS, GTO, BJTS, MCT, MOSFET and IGBT. Electromagnetic interference.	4
2.	AC to DC Converters: Operation and analysis of Single phase and multi-phase uncontrolled and controlled rectifiers with R, RL and back EMF load, effect of source inductance, freewheeling effect, power factor improvement methods for phase controlled rectifiers, filters.	4
3.	AC to AC Voltage Converter: Operation and analysis of single phase integral cycle and phase controlled converters, Configuration of three phase controllers.	4
4.	DC to DC Converters: Single phase and three phase bridge inverters, VSI and CSI, voltage control-PWM & Square wave operation, Harmonics and their reduction techniques.	4
5.	Cycloconverters: Single phase and three phase-configurations and operating Principle.	2

6.	Thyristor controlled D.C. drives: Single-phase series D.C. motor drives, three phase drives, dual converters, reversible drives, speed regulation by armature current controlled, speed regulation by armature voltage controlled, speed regulation of D.C. series and shunt motor, VDR method of speed regulation of shunt motor with change in supply voltage, D.C. chopper speed control. Brush less drive.	8
7.	Thyristor controlled A.C. drive: Induction motor: various scheme of speed control and constant frequency operation, Variable frequency operation, operation on non- sinusoidal voltage source, speed control by chopper, synchronous motor control, comparison between A.C & D.C. drive, Choice between A.C. & D.C. drives.	8

Laboratory & Assignments:

- Study of V.I. characteristic of SCRS triac & diac.
- Study of BJT, IGBT, GTO & MOSFET
- To Study a UJT firing circuit for the control of SCRS.
- To generate and study the PWM control signal for Single Phase dc to ac inverter.
- To Study and use of the single phase half controlled & fully controlled AC to DC Converter and effect of firing angle control on load voltage & wave Forms.
- To study and use of back to back connected SCR/triac Controlled AC Voltage controller and its wave forms with Variation of firing angle.
- To study & use chopper circuit for the control of DC Voltage using (1) Pulse width control (2) Frequency Control & (3) Current limit Control.
- Study of Single Phase inverter and its wave form.
- Study of Three phase firing circuit with synchronization, and testing with three phase AC to DC bridge converter.
- Testing of wave forms of digital firing modules.
- Study and Testing of a Three Phase bridge inverter with different types of loads.
- To Study the harmonics & reactive power measurement in AC mains with rectifier and AC Voltage Controller loads.

Text Books:

1. Rashid Muhammad, H., "Power Electronics: Circuits, Devices and Applications", 2nd Ed. Prentice-Hall, 1998.
2. Dubey, G.K., Doradlla, S.R., "Thyristerised Power Controllers", Wiley Eastern, 1987.

Reference Books:

1. Mohan Ned, Undeland Tore, M. and Robbins William, P., "Power Electronics: Converter, Applications and Design", John Wiley & Sons, 1994.
2. Landev Cyril, W., "Power Electronics", McGraw Hills, London, 1981.
3. Dewan, S.B. and Satrughan A., "Power Semiconductor Circuits", John Wiley & Sons, 1975.
4. Theodore Wildi, "Electronics machines, drives and power systems", Pearson Edu.