

GUJARAT TECHNOLOGICAL UNIVERSITY

Power Electronics

B. E. SEMESTER: VI

Subject Name: **Power Processing Circuits-I**

Subject Code: **162405**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
4	0	0	4	70	30	50

Sr. No.	Course Contents	Total Hrs
1.	Uncontrolled Rectifier: <ul style="list-style-type: none">• Basic Rectifier concept• 1-Phase uncontrolled rectifiers with different kinds of loads, line side and load side voltage and current waveforms• 3-Phase uncontrolled rectifiers with different kinds of loads line side and load side voltage and current waveforms• Effects of 1- phase rectifier on Neutral Currents on 3-Phase , 4 wire systems• Comparison of 1-phase and 3-phase rectifiers• Effects of Line inductance on current commutation• Modelling of uncontrolled rectifier	6
2.	Phase Controlled Rectifier: <ul style="list-style-type: none">• 1-Phase controlled rectifier with different kinds of loads, line side and load side voltage and current waveforms• 3-Phase controlled rectifiers with different kinds of loads, line side and load side voltage and current waveforms• Effects of 1- phase rectifier on Neutral Currents on 3-Phase , 4 wire systems• Effects of Line inductance on current commutation• Continuous and discontinuous conduction• Inverter mode of controlled rectifier• Modelling of controlled rectifier	8

3.	Dc Power Supply Types and Linear Dc Power Supplies: <ul style="list-style-type: none"> • Concept of DC power supply, DC-DC converters, terminology related to DC power supply • Types of DC-DC converters based on different criteria like isolation, input output voltage relationship, mode of control, polarity of output voltage and current, number of outputs, commutation method used etc. • Voltage and current mode control of power supply • Linear regulated power supply, three and four terminal IC based linear regulators • Efficiency of linear regulated power supply • Input and output filter for linear regulated power supply 	6
4.	Thyristor Based Dc Choppers: <ul style="list-style-type: none"> • Thyristor as electronic switches for DC switching, its turn ON and turn OFF process, Principle of DC to DC conversion and DC chopper, Class A, B, C, D and E choppers • Commutation of thyristor based chopper, multi quadrant chopper, Control strategies and analysis of chopper • Working principle, operation, analysis and control of Jone's Chopper and Morgan's chopper, voltage and current waveforms • Multiphase chopper • Analysis and modelling of thyristor based chopper 	6
5.	Non Isolated Switching Dc-Dc Converters: <ul style="list-style-type: none"> • Basic buck, boost and buck-boost converters, analysis, voltage and current waveforms at various points of these converters • Operating principle and analysis of Cuk' converter, Luo Converter, Sepic converter etc. Voltage and current waveforms at various points of various converters • Power loss in various non-isolated DC-DC converters • Analysis and modelling of non isolated DC-DC converters 	6
6.	Isolated Dc-Dc Converters: <ul style="list-style-type: none"> • Power circuit, working, input-output relationship, efficiency, voltage and current waveforms etc. Of Fly back, Forward, Push-pull, Half bridge, Full bridge, cuk' converter etc. • Output rectifier and filter circuits for isolated converters • Analysis and modelling of isolated DC to DC converters 	8
7.	Resonant Converters: <ul style="list-style-type: none"> • Classification and basic concept of resonant circuit, Load resonant converter, Resonant switch converters • Concept of ZVS and ZCS, ZVS clamped voltage DC-DC converter • Analysis and modelling of resonant DC-DC converters 	8

Text Books:

1. Power Electronics- Converters, Applications and Design → Mohan, Undeland and Ribbons
2. Principles of Power Electronics → Kassain, Schlecht and Verghese

Reference Books:

1. Power Electronics Circuits, Devices and Applications → M.H. Rashid
2. Fundamentals of Power Electronics with Matlab → Randal Shaffer
3. Power Converter Circuits → Shepherd and Zhang
4. Power Switching Converters → Simon Ang and Alejandro Oliva
5. Power Electronics Essentials and Applications → L. Umanand
6. Power Electronics Devices, Converters, Applications → Vedam Subramanyam