



# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India  
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
EXC604	Power Electronics I	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weightage)		

<b>Pre-requisite Course Codes</b>	EXC302: Electronic Devices
After successful completion of the course, student will be able to	
<b>Course Outcomes</b>	CO1 Analyze different circuits involving Silicon Controlled Rectifier
	CO2 Interpret tradeoffs involved in power semiconductor devices.
	CO3 Analyze different types of controlled rectifiers and inverters
	CO4 Analyze DC-DC convertors (choppers) and AC-AC converters.

Module No.	Unit No.	Topics	Ref.	Hrs.
1		<b>Silicon Controlled Rectifiers</b>		10
	1.1	Principle of operation of SCR, static and dynamic characteristics, gate characteristics	3,7	
	1.2	Methods of turning on (type of gate signal), firing circuits (using R, R-C, UJT), commutation circuit	3,7	
	1.3	Protection of SCR	3,7	
2		<b>Other Switching Devices</b>		08
	2.1	<b>Principle of operation, characteristics, rating and applications of: TRIAC, DIAC, GTO, MOSFET, IGBT and power BJT</b>	2	
	2.2	Driver circuits for power transistors	2,7	
3		<b>*Controlled Rectifiers</b>		12
	3.1	Half wave controlled rectifiers with R, R-L load,	2,8	
	3.2	Full wave controlled rectifiers, half controlled and fully controlled rectifiers with R, R-L load ( <b>effect of source inductance not to be considered</b> )	2,8	
	3.3	Single phase dual converter, three phase half controlled and fully controlled rectifiers with R load only <b>*Numerical based on calculation of output voltage</b>	2,8	
4		<b>*Inverters</b>		10
	4.1	<b>Introduction, principle of operation, performance parameters of: Single phase half / full bridge voltage source inverters with R and R-L load, three phase bridge inverters (120° and 180° conduction mode) with R and R-L load</b>	2,7	
	4.2	Voltage control of single phase inverters using PWM techniques, harmonic neutralization of inverters, applications <b>*Numerical with R load only</b>	2,7	



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<b>5</b>		<b>Choppers</b>		<b>06</b>
	<b>5.1</b>	Basic principle of step up and step down choppers	2	
	<b>5.2</b>	<b>DC-DC switching mode regulators:</b> Buck, Boost, Buck-Boost, Cuk regulators, (CCM mode only)	2	
<b>6</b>		<b>AC Voltage Controllers</b>		<b>04</b>
	<b>6.1</b>	Principle of On-Off control, principle of phase control, single phase bidirectional control with R and RL load	1,2	
<b>7</b>		<b>Cycloconverter</b>		<b>02</b>
	<b>7.1</b>	Introduction, single phase and three phase Cyclo-converters, applications	2,7	
			<b>Total</b>	<b>52</b>

## References:

- [1] M. H. Rashid, "Power Electronics", Prentice-Hall of India, Third Edition.
- [2] Ned Mohan, "Power Electronics", Undeland, Robbins, John Wiley Publication, Third Edition.
- [3] Ramamurthy, " Thyristors and Their Applications", East-West Press, Third Edition.
- [4] Alok Jain, "Power Electronics and its Applications", Penram International Publishing (India) Pvt. Ltd, Second Edition.
- [5] Vedam Subramanyam, "Power Electronics", New Age International, Second Edition.
- [6] Landers, "Power Electronics", McGraw Hill, Second Edition.
- [7] M.D. Singh and K. B. Khanchandani, "Power Electronics", Tata McGraw Hill, Second Edition.
- [8] P. C. Sen, "Modern Power Electronics", Wheeler Publication, Second Edition.