

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
EXC604	Power Electronics I	04	--	--	04	--	--	04

Subject Code	Subject Name	Examination Scheme								
		Theory Marks					Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam					
		Test 1	Test 2	Avg. of Test 1 and Test 2						
EXC604	Power Electronics I	20	20	20	80	--	--	--	100	

Course Pre-requisite:

- EXC302: Electronic Devices

Course Objectives:

1. To teach power electronic devices and their characteristics.
2. To highlight power electronic based rectifier, inverter and chopper.

Course Outcomes:

After successful completion of the course student will be able to

1. Discuss tradeoffs involved in power semiconductor devices.
2. Analyze different types of rectifier and inverter.
3. Carry out verifications of issues involved in rectifier via simulations

Module No.	Unit No.	Contents	Hrs.
1		Silicon Controlled Rectifiers	10
	1.1	Principle of operation of SCR, static and dynamic characteristics, gate characteristics	
	1.2	Methods of turning on (type of gate signal), firing circuits (using R, R-C, UJT), commutation circuit	
	1.3	Protection of SCR	
2		Other Switching Devices	08
	2.1	Principle of operation, characteristics, rating and applications of: TRIAC, DIAC, GTO, MOSFET, IGBT and power BJT	
	2.2	Driver circuits for power transistors	
3		*Controlled Rectifiers	12
	3.1	Half wave controlled rectifiers with R, R-L load,	
	3.2	Full wave controlled rectifiers, half controlled and fully controlled rectifiers with R, R-L load (effect of source inductance not to be considered)	
	3.3	Single phase dual converter, three phase half controlled and fully controlled rectifiers with R load only *Numerical based on calculation of output voltage	
4		*Inverters	10
	4.1	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	
	4.2	Voltage control of single phase inverters using PWM techniques, harmonic neutralization of inverters, applications *Numerical with R load only	
5		Choppers	6
	5.1	Basic principle of step up and step down choppers	
	5.2	DC-DC switching mode regulators: Buck, Boost, Buck-Boost, Cuk regulators, (CCM mode only)	
6		AC Voltage Controllers	4
	6.1	Principle of On-Off control, principle of phase control, single phase bidirectional control with R and RL load	
7		Cycloconverter	2
	7.1	Introduction, single phase and three phase Cyclo-converters, applications	
		Total	52

Recommended Books:

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

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered as final IA marks

End Semester Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
- 3: Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
- 4: Remaining questions will be selected from all the modules.