

Branch Name:	Electrical Engineering
Program Code	ET403
Course Name:	POWER ELECTRONICS
Course Code:	2ET4030503
Pre-requisite Course:	

COURSE OBJECTIVE:

The theory should be taught and practical should be undertaken in such a manner that students are able to

1. Understand construction of different power electronic devices.
2. To understand working of SCR Protection and Commutating Circuits.
3. Troubleshooting in chopper circuits.
4. Understand inverters and cyclo-converter circuits.
5. Select power semiconductor devices in different applications.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
4	-	2	5	60	40	20	30	150

DETAILS OF COURSE CONTENTS:

Sr No	Topics and Sub-topics	Total Hours	% Weightage
1	Power Electronic Devices- Characteristics protection and working parameters 1.1 Thyristor family 1.2 Working and characteristics of SCR, IGBT, GTO, MCT, Diac, Triac 1.3 Need of SCR protection- Over voltage, over current, di/dt, dv/dt Heating, 1.4 Need of snubber circuit, heatsink, freewheeling diode. 1.5 Turnoff Methods of SCR- 1.6 Natural and forced commutation. 1.7 Voltage, current and power ratings of SCR	14	20

2	Three phase uncontrolled and Single-phase controlled rectifiers 2.1 compare single phase and 3 phase rectifiers. 2.2 Three phase half wave, full wave uncontrolled rectifier 2.3 Six phase half wave, double star six phase rectifier 2.4 Derive rms current and voltage I_{dc} and E_{dc} for 3 phase half and full wave rectifier. 2.5 Transformer reactance, SUF , controlled rectifier. 2.6 Principle of AC Load control using SCR	14	25
3	Choppers and Inverters 3.1 Working Principle of Chopper 3.2 Configuration of Chopper 3.3 Jone's chopper circuit 3.4 Morgan's chopper 3.5 Chopper control 3.6 Principle of Inverter. 3.7 Single phase inverters- series parallel and half and full bridge, square wave, quasi wave inverter. 3.8 Methods of Voltage control in inverter- single pulse, multiple pulse and sine pulse modulation 3.9 Introduction to multilevel inverter- 3 level inverter diode clamped and capacitor clamped 3.10 Basics of Harmonics and power quality in power electronic 3.11 Application of inverter in solar energy using buck boost conversion.	16	30
4	Electric drives and Control 4.1 Block diagram of electric drives 4.2 Different parts of electric drives 4.3 Power Modulators 4.4 AC Drives – Inverter based 4.5 DC Drives- Rectifier and Chopper based 4.6 Cycloconverters -types, application and disadvantages. 4.7 4 Quadrant operation of DC drive 4.8 Speed control of 3phase induction motor using chopper. 4.9 Regenerative braking control in E- Vehicles 4.10 Single phase half and full converter drives 4.11 Speed control of Induction motor using various controls- Voltage, frequency V/F control	12	25

COURSE OUTCOME:

The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:

1. Understand construction of different power electronic devices.
2. Maintain phase controlled rectifiers.
3. To understand SCR Commutating Circuits.
4. Troubleshooting in chopper circuits.
5. Understand inverters and cyclo-converter circuits.
6. Select power electronic devices for specific applications.

LIST OF PRACTICAL:

SR NO	PRACTICALS/EXPERIMENTS
1	Write the three phases half wave rectifier & test the performance.
2	Write the three phase full wave bridge rectifier & test the performance.
3	Check the performance of six phase half wave rectifier.
4	Test the performance of TRIAC for AC load control
5	design and Trouble shoot Snubber Circuit
6	Use R-C Phase shift network for firing angle control of single phase controlled rectifier.
7	To study Speed Control of D.C. Motor using Chopper.
8	To study and perform SCR Commutating Circuits.
9	Performance of Parallel inverter.
10	Performance of Series inverter.
11	Study of Cycloconverter circuit using thyristors.

LIST OF REFERENCES:

1. Power Electronics Bimbhra, P.S. Khanna
2. Power Electronics Singh, M. D. K. Khanchandani, B.
3. www.youtube (lectures on Power electronics)
4. www.google.com
5. www.nptel.iitm.ac.in

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand construction of different power electronic devices.	2 Understanding
CLO2	Maintain phase controlled rectifiers.	1 Understanding 4 Applying
CLO3	To understand SCR Commutating Circuits.	2 Understanding, 4 Applying
CLO4	Troubleshooting in chopper circuits.	3 Applying, 2 Understanding
CLO5	Understand inverters and cyclo-converter circuits.	5,3, 4 Evaluate, Applying, Analyze
CLO6	Select power electronic devices for specific applications	6 Creating

Mapping of CLOs with Pos & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	H				M			L		L			H	L	L
CLO2	L		L		M								H	M	L
CLO3	L								H						M
CLO4			H		L			L				M	M	H	M
CLO5		M			L								M		
CLO6				L							L		L	L	

H: High, M: Medium, L: Low