



Course Title: Power Electronics

Credit Units:

L	T	P/S	SW/F W	TOTAL CREDIT UNITS
3	1	2	-	5

Course Level:UG

Course Code: ELEC304

Course Objectives:

This course intends to teach fundamental concepts of power electronics, various semiconductor devices, their construction, operation, Static & dynamic characteristics and applications.

Pre-requisites:

Basic Electrical Engineering, Electronic Devices & circuits

Course Contents/Syllabus:

	Weightage (%)
Module I : Introduction	
Characteristics and switching behaviour of different solid-state devices namely Power Diode, SCR, TRIAC, DIAC, MOSFET, IGBT, MCT and power transistor .Two-transistor analogy of SCR, Firing circuits of SCR and TRIAC, SCR gate characteristics, SCR ratings. Protection of SCR against over current, over voltage, high dV/dt, high dI/dt. Thermal protection Methods of commutation. Series and Parallel operation of SCR	10
Module II : Controlled Rectifiers	
Types of Converters, effect of inductive load, Commutating diode or freewheeling diode, controlled rectifiers, Bi phase half wave, single phase full wave phase controlled converter using bridge principle, harmonics	20
Module III : DC to DC Converters	
DC choppers, Chopper classification, two quadrant chopper, Four quadrant chopper	10
Module IV : D.C. to A.C. Converter	20

Classification, basic series and improved series inverter, parallel inverter, single phase voltage source inverter, steady state analysis, Half bridge and full bridge inverter: voltage control in single phase inverters, PWM inverter, reduction of harmonics, current source inverter, three phase bridge inverter.	
Module V : A.C. to A.C. Converter	
Classification, principle of operation of cycloconverter. Single phase to single phase cycloconverter with resistive and inductive load. Three phase to single phase cyclo converter, Three phase to three phase cyclo converter. Output voltage equation of cyclo converter	20
Module VI : AC Voltage Controllers	20
Types of AC voltage Controllers, AC Phase Voltage controllers, single Phase Voltage Controller with RL load, harmonic analysis of single phase full wave controller with RL load.	

Student Learning Outcomes:

After completing this course, students will be able to

1. Understand the construction of all semiconductor devices
2. Study SCR its turn on methods, turn off methods, protection.
3. Know working, construction of DC to AC converters, AC voltage regulators
4. Understand working & construction of Cycloconverters & analyse for different types of loads

Pedagogy for Course Delivery:

- Class Room Lectures, assignments, Quizzes
- Practical on the Hardware and Software setups

List of Experiments:

1. Study of VI Characteristics of SCR at different gate currents.
2. Study & plot of characteristics of diode, thyristor and triac.
3. Study & plot of characteristics of transistor and MOSFET.
4. Study & experimentation of firing angle control of R and R-C firing circuits.
5. Study & firing angle control of UJT firing circuit.
6. Different types of commutation..
7. Study & execution of A.C. phase control.
8. Study & execution of full wave converter.
9. Study & execution of dc chopper.
10. Study & execution of series inverter

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total
80	20	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	Attendance	Class Test	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Lab/ Practical/ Studio Assessment:

Continuous Assessment/Internal Assessment					End Term Examination		
Components (Drop down)	Performance	Lab file	Viva	Attendance	PR	V	70
Weightage (%)	10	10	5	5	35	35	

Text Reading:

- M.H. Rashid, "Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition, 2004.
- M.D. Singh and K.B. Khanchandani, "Power Electronics" Tata MC Graw Hill, 2005
- V.R. Moorthy, "Power Electronics : Devices, Circuits and Industrial Applications" Oxford University Press, 2007.

References:

- M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd., 2004
- Chakrabarti & Rai, "Fundamentals of Power Electronics & Drives" Dhanpat Rai & Sons.
- Ned Mohan, T.M. Undeland and W.P. Robbins, "Power Electronics: Converters, Applications and Design", Wiley India Ltd, 2008.
- S.N. Singh, "A Text Book of Power Electronics" Dhanpat Rai & Sons