Course Name Power Electronics

Course Code EE604

Course Credit 3

Contact Hour 2L-1T

Prerequisite

Course Objective

The objectives of this course are

1. Ability to understand and explain the principle of operation and performance of different power electronics devices.
2. Ability to prepare the students to analyze and design different power converter circuits.
3. Ability to troubleshoot the operation of different power semiconductor devices.
4. Ability to study the various applications of power electronics to practical industrial applications, home appliances, power supply and controlling the flow of power.

Course Outcome

On completion of the course students will be able to

1. Acquire knowledge about fundamental concepts and techniques used in power electronics.
2. Analyze various single phase and three phase power converter circuits and understand their applications.
3. Identify basic requirements for power electronics based design application.
4. Develop skills to build, and troubleshoot power electronics circuits.
5. Understand the use of power converters in commercial and industrial applications.

CO Mapping with departmental POs

H: High, M: Medium, L: Low

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	H	M										
CO 2	M	H	L									
CO 3			M		L							
CO 4			M	M								
CO 5	M		M	M	L							

Course Content

Module I:Introduction

Concept of power electronics, application of power electronics, uncontrolled converters, advantages and disadvantages of power electronics converters, power electronics systems, power diodes, power transistors, power MOSFETS, IGBT and GTO.

Module II: PNPN devices

Thyristors, brief description of members of Thyristor family with symbol, V-I characteristics and applications. Two transistor model of SCR, SCR turn on methods, switching characteristics, gate characteristics, ratings, SCR protection, series and parallel operation, gate triggering circuits, different commutation techniques of SCR.

Module III: Phase controlled converters

Principle of operation of single phase and three phase half wave, half controlled, full controlled converters with R, R-L and RLE loads, effects of free wheeling diodes and source inductance on the performance of converters. External performance parameters of converters, techniques of power factor improvement, single phase and three phase dual converters.

Module IV: DC-DC converters

Principle of operation, control strategies, step up choppers, types of choppers circuits based on quadrant of operation, performance parameters, multiphase choppers and switching mode regulators.

Module V: Inverters

Definition, classification of inverters based on nature of input source, wave shape of output voltage, method of commutation & connections. Principle of operation of single phase and three phase bridge inverter with R and R-L loads, performance parameters of inverters, methods of voltage control and harmonic reduction of inverters. Brief idea of Resonant Pulse inverters.

Module VI: AC controllers

Principle of on-off and phase control, single phase and three phase controllers with R and R-L loads. Principle of operation of cycloconverters, circulating and non circulating mode of operation, single phase to single phase step up and step down cycloconverters, three phase to single phase Cycloconverters, three phase to three phase Cycloconvetter.

Module VII: Applications

Speed control of AC and DC motors. HVDC transmission. Static circuit breaker, UPS, static VAR controller.

Text Books:

1. Power Electronics, M.D. Singh and K.B. Khanchandani, Tata Mc Graw Hill. 2007

2. Power Electronics, V.R. Moorthi, Oxford, 2005

3. Power Electronics, M.H. Rashid, PHI, 3rd Edition

4. Power Electronics, P.S. Bhimra, Khanna Publishers, 3rdEdition.

Reference Books:

1. Modern Power Electronics & AC drives, B.K. Bose, Prentice Hall

2. Power Electronics, Mohan,Undeland & Riobbins,Wiley India

3. Element of power Electronics, Phillip T Krein, Oxford, 2007

4. Power Electronics systems, J.P. Agarwal, Pearson Education, 2006

5. Power Electronics, M.S. Jamal Asgha, PHI, 2007

6. Analysis of Thyristor power conditioned motor, S.K.Pillai, University Press.

7. Power Electronics : Principles and applications, J.M. Jacob, Thomson