

Nirma University
School of Technology, Institute of Technology
Electronics & Instrumentation Engineering
B. TECH. SEMESTER -IV

L	T	P	C
3	0	2	4

Course Code	2EI402
Course Title	Industrial Electronics

Course Learning Outcome:

At the end of the course, students will be able to -

1. explain various power electronic devices
2. simulate, analyse and develop different application circuits based on thyristors
3. illustrate the principle of operation and applications industrial heating and welding

Syllabus

**Teaching
Hours**

UNIT 1: Introduction:

Introduction of Power Electronics, Thyristors : definition and basic introduction of the members of thyristor family.

2

UNIT 2 : Thyristor Basics: Silicon controlled rectifier, SCR Construction, SCR terminology and two transistor model, Static and dynamic characteristics of SCR, Turn-on methods of a Thyristor, Different triggering circuits for SCRs, Turn-off methods of Thyristor, Different methods of forced commutation, Thyristor ratings, Comparison of SCRs & transistors, The SCR crowbar.

12

UNIT 3 : Power Semiconductors Devices:

Power semiconductor devices – Diac, Triac, Power transistor, Power MOSFET, IGBT, MCT, Comparison between Power transistor, Power MOSFET and Power IGBT.

6

UNIT 4 : Series and Parallel Operation of SCRs:

Series Operation, Need for equalizing network, Triggering of series connected thyristors, Parallel operation, Methods for ensuring proper current sharing, Triggering of parallel connected thyristors, String efficiency, Derating, Prolems

8

UNIT 5: Phase Controlled Converters:

Classification of controlled converters, Single phase half wave controlled rectifier, Single phase full wave controlled rectifier, Single phase half controlled bridge rectifier, Symmetrical and asymmetrical configurations, Single phase full controlled bridge rectifier, Three phase controlled converters – Half wave converter, semi-converter and full converter (All configurations with different types of loads), Problems

UNIT 6: Heating and Welding Control:

8

Introduction, Various types of industrial heating, Principle of induction heating, Theory of induction heating, Applications of induction heating, Principle of dielectric heating, applications of dielectric heating, Welding, Scheme for AC resistance welding, Welding cycle, Types of resistance welding.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. M. D. Singh & K. B. Khanchandani, Power Electronics, Tata McGraw Hill Publication.
2. B. Paul, Industrial Electronics & Control, PHI Publication.
3. C. D. Simpson, Industrial Electronics, Prentice-Hall Inc. Publication.
4. M. H. Rashid, Power Electronics – Circuits, Devices and Applications, Pearson Education.

