

POWER ELECTRONICS (3+1)

Course outline

By: Prof. Dr. Syed Enamul Haque

| Week # | Lecture Contents/Material | Assignment |
|--------|---|--|
| 01 | Introduction to Power Electronics, Chapter 01. Introduction, Comparison of different semiconductor devices, Relative performance of semiconductor devices. | |
| 02 | Chapter 01 (continued) Rotating Electric Drives, Solid State Power conditioning Unit (PCU), Direct current drive. | |
| 03 | Chapter 01 (continued) The Alternating Current Drives. | |
| 04 | Chapter 01 (continued) Line Commutated Converter, Volt-Ampere Reactive (VAR) Generator, Summary and Review Questions. | HW1: Write a short note on alternate methods of electrical power generation. |
| 05 | Semiconductor Devices, Chapter 02. Basic semiconductor properties, devices and circuits, Transistors, MOSFETs. | |
| 06 | Chapter 02 (continued) Insulated Gate Bipolar Transistors, Static Induction Transistors, Static Induction Thyristors, | |
| 07 | Chapter 02 (continued) MOS Controlled Thyristor, Thyristor: Thyristor static characteristics, Thyristor Turn-on, Thyristor commutation. | |
| 08 | Chapter 02 (continued) Thyristor Ratings, Power dissipation in thyristors, Thyristors in series, Thyristors in parallel. | HW2: Compare all the power semiconductor devices discussed in this chapter |
| 09 | Chapter 02 (continued) Turn-on (Firing) Circuits of Thyristors, Turn-off (Commutation) Circuits of Thyristors, Other members of thyristor family, Review Questions. | . |
| 10 | MID TERM EXAMINATIONS | |
| 11. | AC Line Voltage Control, Chapter 04. Introduction, Single phase controller with Resistive load, Single phase controller with RL load, | |
| 12. | Chapter 04 (continued) Example 4.1, Example 4.2, Tap changing Transformer, Example 4.3. | HW3: What are the advantages and disadvantages of transformer tap changers? |
| 13. | Chapter 04 (continued) Integral cycle control, Example 4.4, Three-Phase AC Regulator. | |
| 14. | Inverters, Chapter 06. Introduction, Principle of operation, Performance parameters of an inverter. | HW4: Write short notes on the applications of inverters with reference to the alternate energy resources. |
| 15. | Chapter 04 (continued) Single phase Bridge inverter, Example 6.1. | |
| 16. | To be specified | |

POWER ELECTRONICS (3+1)

Course outline

By: M. AAMIR (Lecturer)

| Week # | Lecture Contents/Material | Lab/Project |
|--------|--|--|
| 01 | General Introduction of the course, Discussion about Marks Distribution, Discussion about the Pre-requisites of Chapter # 03. | |
| 02 | Uncontrolled and Controlled Rectifiers, Chapter 03. Introduction, Uncontrolled Rectification using diodes. | Minor Project #1 : Dual Polarity Power Supply (5 marks) |
| 03 | Chapter 03 (continued) Performance parameters of a transformer, Example 3.1, Reading assignment on three-phase circuits. | Hardware Experiment # 01 |
| 04 | Chapter 03 (continued) Multiphase Uncontrolled Rectifiers, 3-phase star connected Rectifier, Example 3.2. | Hardware Experiment # 02 |
| 05 | Chapter 03 (continued) Three-phase bridge rectifier, Example 3.3, Introduction to controlled rectification. | Hardware Experiment # 03 |
| 06 | Chapter 03 (continued) An introduction to Thyristor, Single-phase half wave and full wave controlled rectifiers with resistive load. | Hardware Experiment # 04 |
| 07 | Chapter 03 (continued) Half wave rectification with RL load, Example 3.4 | Hardware Experiment # 05 |
| 08 | Chapter 03 (continued) Example 3.5, Example 3.6, Effect of free wheeling diode. | Hardware Experiment # 06 |
| 09 | Chapter 03 (continued) Three phase Converters, Paper pattern of Mid term exam. | |
| 10 | MID TERM EXAMINATIONS | |
| 11. | DC Choppers, Chapter 05. Introduction, Classical Methods of obtaining variable DC. | Software Experiment # 01, Project # 02 (10 marks with presentation) |
| 12. | Chapter 05 (continued) Principle of step down chopper, Example 5.1 | Software Experiment # 02 |
| 13. | Chapter 05 (continued) Principle of step up chopper, Different modes of step up operation. | Software Experiment # 03 |
| 14. | Chapter 05 (continued) Switching mode regulators. | Software Experiment # 04 |
| 15. | <i>To be specified</i> | Lab performance/Viva |
| 16. | <i>To be specified</i> | Lab performance/Viva |

Recommended Books

1. Power Electronics circuits, devices and applications by M.H. RASHID.
2. Power Electronics by NED MOHAN.
3. Power Electronics by P.S. Bhimbhra.

Note: ICAPS would be used for the simulation of power circuits.