

## Fundamentals of Power Electronics

The course contains 52 class hours, including:

1. Introduction (2 Hrs)
  - 1.1 Introduction to power electronics
  - 1.2 Applications
  - 1.3 Elements of power electronics
2. Power Devices (4 Hrs)
  - 2.1 uncontrolled power devices
  - 2.2 semi-controlled power devices
  - 2.3 controllable power devices
3. Diode Rectifiers (3 Hrs)
  - 3.1 single-phase rectifier
  - 3.2 three-phase rectifier
  - 3.3 power factor
4. Thyristor AC-DC (5 Hrs) Discussion (1 Hr)
  - 4.1 operation principle of thyristor-based circuit
  - 4.2 single-phase rectifier
  - 4.3 three-phase rectifier
5. DC-DC Converters (4 Hrs)
  - 5.1 basic principles of DC/DC conversion
  - 5.2 topologies of DC/DC converters
    - Buck regulator
    - Boost regulator
    - Buck-Boost regulator
    - Cuk regulator
    - Full-bridge regulator
6. DC-AC Inverters (6 Hrs)
  - 6.1 pulse width modulation principle
  - 6.2 single-phase bridge inverter
  - 6.3 three-phase bridge inverter
  - 6.4 effect of blanking time
7. AC-AC Cycloconverters (3 Hrs)
8. Snubber Circuits (2 Hrs)
  - 8.1 basic principles of snubber circuit
  - 8.2 turn-off snubber
  - 8.3 turn-on snubber
9. Firing Circuits (4 Hrs)
10. Introduction of Motor Drive (2 Hrs)
11. DC Motor Drive (6 Hrs)

12. AC Motor Drive (4 Hrs)

13. Switching Mode Power Supply (4 Hrs) Discussion (2 Hrs)

The course also has 10 Hrs for experiments, including:

- 1) 3-phase active rectifier and inverter
- 2) DC/DC converter
- 3) 3-phase DC/AC converter
- 4) dual closed-loop DC motor drive
- 5) 3-phase variable frequency motor drive