# DESIGN OF POWER ELECTRONIC SYSTEMS

**Hours Per Week :**

| L | T | P | C |
|---|---|---|---|
| 3 | - | 2 | 4 |

**Total Hours :**

| L | T | P |
|---|---|---|
| 50 | - | 20 |

| WA/RA | SA | SSH | S | BS |
|---|---|---|---|---|
| 5 | 8 | 40 | 5 | 5 |

**Course Description and Objectives:**

This course enables to understand the operation and design of Magnetic components Inductors and Transformers. It also helps to understand the design of Inductors and Transformers Heat sinks and the design of power converters

**Course Outcomes:**

Upon successful completion of this course, the student should be able to:

a. Design switching using power semiconductor devices.
b. Specify design criteria (power, efficiency, ripple voltage and current, harmonic distortions, power factor).
c. Identify basic requirements for power electronics based design application.

**SKILLS ACQUIRED:**

- ✓ Designing a Gate driver circuits for different power semi conductor switches.
- ✓ Designing a suitable inductor , capacitor and transformer of flyback converter
- ✓ Designing a suitable flyback converter for an application
- ✓ Designing suitable forward converter for an application

**ACTIVITIES:**

1. Design of Gate driver circuits for different power semi conductor switches.
2. Design flyback converter for Laptop charger
3. Design flyback converter for LED lighting system
4. Design flyback converter for Mobile phone charger
5. Design forward converter LED lighting system
6. Design forward converter Laptop charger
7. Design forward converter Mobile phone charger

**UNIT - I** **L- 10**

**Design of Magnetics Components:** Magnetic materials and core-Copper winding-Thermal considerations.

**UNIT - II** **L- 10**

**Design of Inductors :** Analysis of specific Inductor Design-Inductor design procedure-Problems

Design of Transformers : Analysis of specific Transformer - design-Eddy currents-Transformer leakage inductance-Transformer design procedure.

**UNIT - III** **L- 10**

**Gate and Base Driver circuits:** Preliminary Design considerations-dc coupled Drive circuits-Electrically isolated drive circuits-Cascode connected drive circuits-Thyristor drive circuits-Power device protection in drive circuits.

**UNIT - IV** **L- 10**

**Heat Sinks:** Control of semiconductor device temperature-Heat transfer by conduction-Heat sinks- Heat transfer by radiation and convection.

**UNIT - V** **L- 10**

**Design of Converters:** Design of single phase full bridge AC/DC converter-Design of buck, boost, buck-boost converters-Design of flyback converter-design of forward converter

**TEXT BOOKS :**

1. Muhammad H. Rashid, "Power Electronics - Circuits, Devices and Applications", Academic Press, New Delhi, 2nd Edition, 2006.

2. Mohan, Ned. et.al, "Power Electronics Converters, Applications and Design", Wiley India Pvt. Ltd., New Delhi, 3rd Edition 2007.

**REFERENCE BOOKS:**

1. B. Jayant Baliga, "Fundamentals Of Power Semiconductor Devices", Springer-Verlag Publication, New Delhi , 1st Edition, 2008.

2. Robert Perret, "Power Electronics Semiconductor Devices", Wiley-ISTE Publications, New Delhi , New Edition, 2009.