

## Course Syllabi: UEE504: Power Electronics (L : T : P :: 3 : 1 : 2)

1. **Course number and name:** UEE504: Power Electronics
2. **Credits and contact hours:** 4.5 and 6
3. **Text book, title, author, and year**

### **Text Books / Reference Books**

- *Dubey, G.K., Doradla, S.R., Joshi, A. and Sinha, R.M.K., Thyristorised Power Controllers, New Age International (P) Limited, Publishers (2004).*
- *Rashid, M., Power Electronics, Prentice–Hall of India (2006).*
- *Bimbhra, P.S., Power Electronics, Khanna Publishers (2012).*
- *Mohan, N., Underland, T. and Robbins, W. P., Power Electronics: Converter Applications and Design, John Wiley (2007) 3<sup>rd</sup>ed.*
- *Bose, B.K., Handbook of Power Electronics, IEEE Publications.*

a. Other supplemental materials

- Nil

### **4. Specific course information**

a. Brief description of the content of the course (catalog description)

**Introduction:** Introduction to Thyristors and its family, static and dynamic characteristics, turn-on and turn-off methods and firing circuits, Ratings and protection of SCRs, series and parallel operation.

**Phase Controlled Converters:** Principle of phase control, Single phase and three phase converter circuits with different types of loads, continuous and discontinuous conduction, effect of source inductance, Dual converters and their operation.

**DC Choppers:** Principle of chopper operation, control strategies, types of choppers, step up and step down choppers, steady state time domain analysis with R, L, and C type loads, voltage, current and load commutated choppers.

**Inverters:** Single phase voltage source bridge inverters and their steady state analysis, modified McMurray half bridge inverter, series inverters, three phase bridge inverters with 180° and 120° modes. single-phase PWM inverters, current source inverters, CSI with R load (qualitative approach).

**AC Voltage Controllers:** Types of single-phase voltage controllers, single-phase voltage controller with R and RL type of loads.

**Cycloconverters:** Principles of operation, single phase to single phase step up and step down cycloconverters, three phase to single phase cycloconverters, output voltage equation for a cycloconverter.

**Laboratory Work:** SCR V-I characteristics, Gate firing circuit, DC -DC chopper, Semi converter and Full converter with R, RL and RLC type of loads, DC shunt motor speed control, Single phase AC voltage controller with R load, Inverters, Simulation of power electronics converters.

**Minor Project:** Design and development of power converters

### **5. Specific goals for the course**

After the completion of the course, the students will be able to:

- Select the power devices as per the usage for energy conversion and control.

- Exhibit the designing of firing and commutation circuits for different converter configurations.
- Analyse various converter configuration / topology with different types of load.
- Identify converter configurations for various power applications.
- Exhibit the usage of power converters for harmonic mitigation, voltage and frequency control.

**6. Brief list of topics to be covered**

- Thyristors
- Phase Controlled Converters
- DC Choppers
- Inverters
- AC Voltage Controllers
- Cycloconverters