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
- 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