

Course	ECE 46000 – Power Electronics
Type of Course	Elective for EE Program
Catalog Description	Introduction to power semiconductor devices, their characteristics and ratings. Analysis and design of power electronics circuits are emphasized. Topics include diode rectifiers, controlled rectifiers, a.c. voltage controllers, thyristor commutation techniques, choppers, pulse-width modulated (PWM) and resonant pulse inverters, static switches, and power supplies.
Credits	4
Contact Hours	Class: 3; Lab: 3
Prerequisite Courses	ECE 25500, ECE 20200
Corequisite Courses	None
Prerequisites by Topics	Have knowledge of diode, bipolar transistor, and FET circuit models for the design and analysis of electronic circuits. Single and multistage analysis and design; introduction to digital circuits. Computer-aided design calculations, amplifier operating point design, and frequency response of single and multistage amplifiers. High-frequency and low-frequency designs are emphasized. Understand the description of deterministic signals through the use of Fourier series. Fourier and Z-transforms. Systems description treated by differential and difference equations including transform methods. Computation of system response to both continuous and discrete inputs.
Textbook	<i>Power Electronics</i> , by Daniel W. Hart, McGraw-Hill, 2010.
Course Outcomes	Students who successfully complete this course will have demonstrated an ability to: <ol style="list-style-type: none">1. An ability to calculate power, power factor, and THD for a periodic power source. (2)2. An ability to understand and design buck, boost, and buck-boost dc-dc converters to meet input-output specifications, assuming ideal components. (2)3. Select commercially-available power components that would function in the designs and estimate temperature rise expected in these components. (7)

4. An ability to simplify and analyze power circuits with transformers. (1)
5. Understanding of the operating principles of soft-switch converters and dc-ac inverters. (1)
6. Identify significant power quality concerns in ac and dc power systems. (1)
7. An ability to use computational tools for power electronics circuits design and analysis (6)

Lecture Topics

- Power semiconductor devices
- Switches
- Magnetic circuit concepts
- Computer Simulation of Power Electronic Circuits
- AC-DC Converters (Rectifiers)
- DC-DC Converters (Choppers)
- DC-AC Converters (Inverters)
- Phase Displacement Control
- Soft Switching Techniques
- Resonance
- Switch-mode power supply

Computer Usage	High
Laboratory Experience	High
Design Experience	High
Coordinator	Elizabeth A. Thompson, Ph.D.
Date	09/30/2018