Cleveland State University  
Department of Electrical Engineering and Computer Science

EEC 470 : Power Electronics I

**Catalog data:**
EEC 470 Power Electronics. (3-0-3)  
*Pre-requisites: EEC 314 and EEC 361*
Analysis, performance, characterization, and design of power electronics converters using diodes, thyristors, transistors and other controllable semiconductor switches.

**Textbook:**

**References:**

**Instructor:**
Dr. Ana V. Stankovic,  
Professor of Electrical Engineering and Computer Science.

**Expected Outcomes:**
Upon completion of this course, students should be able to:  
1) Understand power semiconductor switches  
2) Understand the operation of different converters such as: line frequency diode and phase-controlled rectifiers, dc-dc switch-mode converters and dc-ac switch-mode inverters.

**Fulfills The Following Electrical Engineering Program Objectives and Outcomes:**

**Objectives:**
1) Practice electrical engineering in power electronics.  
2) Define and diagnose problems, and provide and implement electrical engineering solutions in industry, business, and government.

**Outcomes:**
(a) An ability to apply knowledge of mathematics, science, and engineering to general electrical engineering and, in particular power electronics.  
(b) An ability to design a system, component, or process to meet desired needs.  
(c) An ability to identify, formulate, and solve electrical engineering problems.  
(d) An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.

**Contribution of Course to Meeting the Professional Component:**
Math & Basic Science: 1 credits;  
Engineering Topics: 2 credits;  
General Education: 0 credits

**Prerequisite by topics:**
1. Kirchhoff’s voltage and current laws in R-L-C circuits.
2. Solution of first- and second-order differential equations.
3. Electric circuits in sinusoidal steady state.
4. Fourier series expansion of periodic waveforms
5. Simulation of electric circuits with PSpice.

**Topics:**

- Power Electronics Systems: 1
- Semiconductor Devices: 4
- Review of Basic Electric Circuit Concepts: 4
- Quizzes: 4
- Rectifiers- Line Frequency Diode Rectifiers: 4
- Line-Frequency Phase -Controlled Rectifiers: 4
- Line-Frequency Phase - Controlled Inverters: 4
- Discussions: 3
- Midterm Exam: 4
- DC/DC Switch Mode Converters- Step Down: 4
- DC/DC Switch Mode Converters - Step-up: 4
- DC/DC Switch Mode Converters -Buck-Boost: 2
- Review: 3
- Total: 45

**Grading:**

- 30% - Midterm Exam
- 35% - Final Exam
- 15% - Quizzes
- 20% - Projects and Homework

**Homework:**

Has to be turned in on time.

**Computer Usage:**

Software: PSPICE

**Estimated ABET Category:**

Engineering Topics: 3 credits or 100%

**Laboratory Projects:**

Power Converter Simulation by using PSPICE
(3 projects and 3 homework assignments)

**Prepared by:** Dr. Ana V. Stankovic

**Date:** 08 20 2013