Cleveland State University
Department of Electrical and Computer Engineering

EEC 470 POWER ELECTRONICS I

Catalog data: EEC 470 Power Electronics. (4-0-4) Analysis, performance, characterization, and design of power electronics converters using diodes, thyristors, transistors and other controllable semiconductor switches. Application of power electronics converters to power supplies and to DC and AC motor drives.

Prerequisites: EEC 314 and EEC 361

Textbook: Mohan, Undeland, and Robbins, **Power Electronics: Converters, Applications, and Design,** Third Edition, John Wiley and Sons, Inc., 2003.

References:

Chapman, **Electric Machinery Fundamentals**, Third Edition, McGraw-Hill, Inc., 1991.

Instructor: Dr. A. V. Stankovic, Assistant Professor of Electrical Engineering
Office hours: Tuesday and Thursday, 3:00-4:00 p.m. or by appointment.

Expected Outcomes:

Upon completion of this course, students should be able to:
1. Undersand 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: 3 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.
6. Balanced three-phase systems.

Week	Topics:	Reading
1 (Aug 30-Sep 3)	Power Electronic Systems Semiconductor Devices	1.1-1.7 2.1-2.5
2 (Sep 6-10)	Semiconductor Devices **Labor Day Holiday September 6**	2.6-2.12
3 (Sep 13-17)	Review of Basic Electric Concepts Fourier Transformation	3.1 –3.2
4 (Sep 20-Sept 24)	Rectifiers (AC-DC)– Line Frequency Diode Rectifiers. Computer Laboratory (PSPICE)	5.1-5.3
5 (Sep 27- Oct 1**)**	Line Frequency Phase-Controlled Rectifiers Computer Laboratory (PSPICE)	6.1-6.2
6 (Oct 4-Oct 8)	Line-Frequency Phase-Controlled Rectifiers and Inverters	6.3 –6.4
7 (Oct 11 –15)	Discussions	
8 (Oct 18-22)	Midterm Exam Discussions	
9 (Oct 25-29)	DC-DC Switch Mode Converters Step-Down (Buck)	7.1-7.3
10 (Nov 1- 5)	Computer Lab – PSPICE	

11 (Nov 8-12)	DC-DC Converters Step-up (Boost), Buck-Boost	7.4,7.5
12 (Nov 15-19)	Switch-Mode DC-AC Inverters	8.1-8.3
13 (Nov 22-26)	Computer Laboratory (PSPICE) **Thanksgiving Holiday**	
14 (Nov 29- Dec3)	Motor Drive Applications	12&13
15 (Dec 6-10)	Motor Drive Applications Review	12&13

Grading:

40% - Midterm Exam
45% - Final Exam
15% - Projects

Homework: **Has to be turned in on time.**

Computer Usage: Software: PSPICE

Estimated ABET Category Engineering Topics: 4 credits or 100%

Laboratory Projects: Power Converter Simulation by using PSPICE

Prepared by: Dr. A. V. Stankovic Date**:** 08 10 04

There will be no make up mid-term and final exams unless a student turns in a written excuse from a physician or an employer.