Power Electronics – Physics 541
Fall 2014
SUNY College at Cortland
Physics Department

Catalog Description

Application of electronics to energy control and conversion with a focus on renewable energy systems. Topics include: amplifier circuits, power semiconductor devices, D.C. to A.C. power conversion, computer based modeling of circuit behavior, New York State and National Electrical Codes, and a final research project involving the design and simulation of novel electronic devices. Prerequiste: PHY 540 (3 cr. hr.)

Required Texts

- *Introductory Electronics for Scientists and Engineers* (2^{nd} Ed.) by Robert Simpson ISBN:0205083773.
- *Power Electronics: Circuits, Devices & Applications* (4^{th} Ed.) by Muhammad Rashid ISBN:0133125904.

Instructor Information

Instructor: Douglas Armstead
Office: 127 Bowers (607) 753-2919
Office Hours: TBA and by appointment.
Email: douglas.armstead@cortland.edu
Lecture meets: TR 4:25pm-5:40pm in TBA.

Expectations

What you should expect from me:

- Explanations of physical concepts that include concrete examples and, where reasonable, demonstrations.
- In-class examples that help you to develop the level of reasoning that is necessary to do the problems you will encounter in the homework and on exams.

- Careful and respectful consideration of your questions.
- An open door policy–if my office door is open you should feel free to come in and talk about physics. This is in addition to my regularly scheduled office hours listed above.

What I expect of you:

- Your presence in class, both physical and mental, for the entire class period.
- To prepare for class. This includes doing the reading at a level that you arrive with questions in hand about the material.
- When you have a question, ask it. Your fellow classmates will thank you–if you are unclear on something, chances are the person next to you is, too.
- Submit work for grading that is your own. If you copy from another student or source and submit it for a grade, then you risk receiving an F in the course.

Grades

The final score for the class is found in the following way:

$$score = \frac{3.5 * H + 2 * P + E_1 + E_2 + E_3 + 1.5 * F}{10} \tag{1}$$

H =homework average, P=Final research and design project, $E_i = i$th takehome exam, and F =final exam. Each term is out of 100.

The homework is a vehicle for your mastering the concepts, techniques, and thought processes relevant to Power Electronics and for communicating this in a way that leads from beginning to end using a clear, methodical plan. There are a number of aids at your disposal: the book, the instructor, in and out of class; and your classmates. But in the end nothing beats quiet concentration and gradually sorting things out for yourself.

Some homework will involve spice simulation and you should think of those simulations as an important part of the solution but that a full solution includes an explanation of your results.

Homework will typically be assigned on Thursday and due on the following Thursday, when solutions will be provided. Allowing late homework is not really in your best interest and will generally not be accepted.

For the research and design project in the course you will develop circuits and code for such applications as monitoring the long-term function of solar-electric or wind-power systems. This work will be carried out under the supervision of the course instructor and, when applicable, with the cooperation of regional business or non-profit partners.

Make-up exams will only be administered for "Excused Absences" (see University Catalog for details). Supporting documentation to excuse your absence will be required.

The score is mapped into a grade roughly as:

Academic Integrity

You are expected to observe the University's statements and procedures on Academic Integrity in the college handbook, Chapter 340. Ask me if you have any uncertainty about what it means to cheat or the distinction between proper collaboration and plagerism.

Final %	Grade
90-100	As
80-89	Bs
70-79	Cs etc.

Improvement and class participation may be used raise a border line grade.

Students with a Disability

If you are a student with a disability and wish to request accomodations, please contact the office of Student Disability Services located in VanHoesen B-1 or call (607) 753-2066 for an appointment. Information regarding your disability will be treated in a confidential manner. Because requests for accommodation take time to review and many accommodations require early planning, requests for accommodations should be made as early as possible.

Class Schedule

All dates are tentative.

Week	Chapter(s)	Topic
8/26	Simpson 9	Op Amp Overview
9/2	Simpson 10	Op Amp Use
9/9	Simpson 10	Op Amp Use Cont. and LTSPICE
9/16	Suppliment	Arduinos and PICs
9/23	Rashid 1	Power electronics overview
		Exam 1 on 9/23.
9/30	Rashid 2	Power diodes and switched LRC
10/7	Rashid 3	Diode Rectifiers
10/14	Rashid 4 & 5	Power Transistors and DC-¿DC converters
		Exam2 on 10/23.
10/21	Rashid 6	DC-¿AC inverters
		Fall break 10/21, no class.
10/28	Rashid 6	DC-¿AC inverters cont.
11/4	Rashid 16	Power Electronics and Renewable Energy
11/11	Rashid 16	Renewable Energy Cont.
11/18	Supplimental	National Electrical Code
		Exam 3 on 11/20.
11/25	Supplemental	R & D Project
		Thanksgiving break, no class on 11/27.
12/2		R & D Project

Final Exam at 4-6pm on Tuesday December 9, 2014