

ECEN 4517/5517 - Power Electronics and Photovoltaic Power Systems Laboratory
Spring 2017
Course Information and Syllabus

Instructor

- Prof. Khurram Afridi, Office: ECOT 342, Phone: (303) 492-8905, Email: khurram.afridi@colorado.edu

Teaching Assistants

- The course has three teaching assistants, one for each section:
 - Section 1: Ashish Kumar, Email: ashish.kumar@colorado.edu (Tuesday),
 - Section 2: Saad Pervaiz, Email: saad.pervaiz@colorado.edu (Wednesday),
 - Section 3: Sreyam Sinha, Email: sreyam.sinha@colorado.edu (Thursday).

Overview

- This course is an introduction to modeling, analysis, design, fabrication, and testing of electrical energy processing systems in a practical laboratory setting. The course focuses on power electronic converters for efficient harnessing, storage, and utilization of solar photovoltaic (PV) energy. The laboratory is equipped with mobile solar PV equipment for every station, including 85-W PV panels, 56-A-hour batteries, 300-W inverters, and other supporting infrastructure. Students design and build power conversion electronics, including analog and digital control circuitry, to work with the available solar PV equipment. The experiments and design project lead to the design, fabrication, and testing of a complete solar power system.
- The course begins with basic experiments in:
 - Photovoltaic power systems and components,
 - Microcontrollers.The course then proceeds to design experiments in the following areas:
 - A maximum power point tracker using a buck converter and a microcontroller,
 - A dc-dc boost converter with analog feedback,
 - A single-phase inverter.Finally, a complete PV system has to be put together using the earlier constructed converters.
- The class will participate in the ECEE Department Expo near the end of the semester. There will also be a solar power competition on the same day to see which group has built the most efficient and effective system.
- ECEN 5517 involves additional work in power converters requiring deeper knowledge and understanding of power electronics.
- This course is offered every spring semester.

Lecture and Laboratory Schedule and Venue

- Lectures: Monday 1-1:50 pm in ECEE 1B32.
- Laboratory Sections:
 - Section 1: Tuesday 12:00 - 3:50 pm in ECEE 1B65 (except week 1 – see Course Calendar),
 - Section 2: Wednesday 12:00 - 3:50 pm in ECEE 1B65,
 - Section 3: Thursday 12:00 - 3:50 pm in ECEE 1B65 (except the last week – see Course Calendar).

Instructor Office Hour

- Monday, 10-11 am (Mountain Time).

Contacting the Instructor and TAs

- Please use "ECEN 5517" or "ECEN 4517" in the subject line for all course-related emails.

Prerequisites

- ECEN 4797/5797 Introduction to Power Electronics.

Laboratory Logistics

- Experiments are done in groups of two. One three-person undergraduate and/or graduate group will be created if there are an odd number of students.
- Each group needs to purchase a lab notebook and a lab kit. The lab kit is available from the ECEE electronic store located in ECEE 1B10. Some additional parts (voltage probes, resistors, capacitors, etc.) will also be needed from the undergraduate electronics lab kit.

Pre-lab Assignments and Lab Reports

- There will be 4 pre-lab assignments and 6 lab reports.
- The pre-lab assignments and lab reports are the collective work of the group.
- Pre-lab assignments and lab reports must be received by 11:59 pm Mountain time on the due date (see Course Calendar). Deadlines are enforced by the system. Late assignments will not be accepted, except in cases of documented medical emergencies.
- To submit your work, write name and email address of every group member on the front page, convert to a single pdf file and submit via Desire2Learn (D2L). If scanning, use 1-bit black-and-white, at 150-300 dpi, with all pages in a single pdf file. Work submitted as multiple images will not be graded and will receive no credit. Keep a copy of your work.

Quizzes

- There will be 2 in-class quizzes administered during lecture time (see Course Calendar). These quizzes will be composed of questions related to the experiment assignments.

Expo and Solar Power Competition

- The solar power competition will be held on Thursday May 4 during the ECEE Department Expo. Groups from each section will display their systems on this day. Awards will be given to the groups whose systems exhibit the highest efficiency and energy capture. The expo grade will be based on the knowledge demonstrated by individual group members, as well as on the demonstrated performance of the system.

Grading

- The course grade will be based on the following:
 - Lab performance and attendance (individual): 15%
 - Pre-lab assignments (group): 15%
 - Lab reports (group): 40%
 - Quizzes (individual): 20%
 - Expo (group): 10%

Textbook and Additional Material

- Erickson and Maksimovic, *Fundamentals of Power Electronics*, Second Edition.
- Extensive additional learning material will be available from the course D2L website.

Online Resources

- D2L: Course information/syllabus, calendar, announcements, discussions, additional learning material, and assignments download and submission. Login using your CU IdentiKey.

Additional Information for All Students

- If you qualify for accommodations because of a disability, please submit a letter from Disability Services in a timely manner (for quiz accommodations provide your letter at least one week prior to the quiz) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Medical Conditions: Injuries, Surgeries, and Illnesses guidelines under Quick Links at Disability Services website and discuss your needs with the instructor.
- Every effort will be made to reasonably and fairly deal with students who have serious religious observances that conflict with scheduled exams, assignments, etc. Please notify the instructor well in advance, so that there is time to make adequate arrangements. The Boulder campus policy can be read at http://www.colorado.edu/policies/fac_relig.html.
- All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found to be in violation of the academic

integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at

<http://www.colorado.edu/policies/honor.html> and at <http://honorcode.colorado.edu>.

- Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at <http://www.colorado.edu/policies/classbehavior.html> and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code.
- The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. The University of Colorado does not discriminate on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status in admission and access to, and treatment and employment in, its educational programs and activities. (Regent Law, Article 10, amended 11/8/2001). CU-Boulder will not tolerate acts of discrimination or harassment based upon Protected Classes or related retaliation against or by any employee or student. For purposes of this CU-Boulder policy, "Protected Classes" refers to race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, or veteran status. Individuals who believe they have been discriminated against should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Student Conduct (OSC) at 303-492-5550. Information about the ODH, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at <http://hr.colorado.edu/dh/>.