Sierra College
Environmental Studies & Sustainability
Division of Sciences & Mathematics

Fall 2012

SYLLABUS

COURSE TITLE: **Advanced Photovoltaic Systems**
ESS 34

INSTRUCTOR:
Steve Geiger
Classroom: RG 222
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REQUIRED TEXT: **Photovoltaic Systems (Second Edition), by James P. Dunlop, PE and the National Joint Apprenticeship and Training Committee (NJATC),** American Technical Publishers, (ISBN # 978-0-8269-1308-1)

RECOMMENDED TEXTS: **Photovoltaics Design and Installation Manual, by Solar Energy International,** New Society Publishers, (ISBN # 978-0-86571-520-2)

National Electrical Code 2011, by National Fire Protection Association, Delmar Cengage Learning, (ISBN # 978-0877659143)

or

National Electrical Code 2011 Handbook, by National Fire Protection Association, Delmar Cengage Learning, (ISBN # 978-0877659167)

REQUIRED SUPPLIES: **Scientific Calculator** with exponential and trigonometric functions.

COURSE DESCRIPTION:
Course builds on the PV fundamentals, design, and installation concepts introduced in ESS30 and ESS32 in order to examine the theoretical and technical dimensions of photovoltaic systems in detail. Topics include advanced principles of electricity and how they apply to PV systems, commissioning, troubleshooting, National Electric Code requirements, and commercial PV installation considerations.

COURSE OBJECTIVES:

Objectives (lecture):

1. Demonstrate advanced knowledge of electrical systems and integration with PV systems.
2. Display knowledge of commercial wiring systems, components, and connections.
3. Demonstrate ability to design a commercial PV installation including fire code clearances.
4. Outline overall PV system construction process from design to final commissioning.
5. Identify the various business opportunities and advanced career pathways available.
6. Evaluate PV system performance using data retrieved via remote monitoring systems.
7. Analyze financial payback methods of photovoltaic systems.
8. 10 Hour Occupational Safety and Health Administration (OSHA) safety card.

Objectives (lab):

1. Design and construct array circuit wiring, grounding, and over-current protection according to national electric code (NEC) requirements.
2. Demonstrate OSHA safety harness, ladder, fall protection, and roof navigation skills.
3. Design a basic residential grid PV tied system observing NEC Article 690 code compliance issues.
4. Correctly assemble PV racking and mounting hardware for a roof mount system.
5. Evaluate and document commercial electrical systems for potential of PV system integration.
6. Troubleshoot an advanced PV system maintenance problem and correctly provide the appropriate remedy.
7. Demonstrate proper safety practices and use of required protective equipment for the installation and maintenance of photovoltaic systems.

VI. PERFORMANCE CRITERIA:

Exams: Two exams worth 100 points each	200
Student Project	100
Lab Activities	300
Quizzes	100
Homework	200
Class Participation	100
Total Points	**1000**

Course Grade	Percentage Range
A	90 -- 100
B	80 -- 89
C	70 -- 79
D	60 -- 69
F	Less than 60
Incomplete	Only granted in very rare circumstances – please see college policy

A. **Student responsibility:** The *student* is responsible for meeting all requirements, prerequisites, deadlines, registration requirements and fees. Incomplete grades will not be given in lieu of poor course work or lack of attendance. Students are expected to be familiar with and to observe rules regarding honesty and plagiarism as outlined in the official college catalog.

B. **Exams:** Each exam will be drawn from textbook material and in-class lecture notes. NO MAKE-UP EXAMS WILL BE GIVEN. You may contact me in advance to request to take an exam early. If so, please be prepared to substantiate the necessity of your request in writing.

C. **Lab Activities:** Students will be assigned a number of hands-on lab activities throughout the semester. These activities will often be performed in groups, but also may be performed individually. Documentation of findings, processes, and methodologies will be required to be turned in to obtain credit for lab activities. No make-up labs will be allowed.

D. **Attendance and Participation:** It is very important that you attend class regularly to benefit from review of reading assignments, lab activities, and lectures. However, your involvement is most important because it gives you the chance to show support and caring for other students for working together in your work teams. Your instructor will take attendance each session and keep track of those students who regularly participate in discussions, small group work, and contribute to a positive classroom environment. If you are absent from lecture five times or more during the semester, you will be jeopardizing your success in this course. Grades are partly based on in-class activities, which will occur *every* session (discussion, contribution to team labs, etc.). None of these activities will be repeated and none will be "made up," and none will be completed "at home," so excessive absences may result in a reduced or even failing grade. Being dropped from the class is not automatic; **it is your responsibility to drop this course if you quit attending class. I will not drop you.** Because

the grading system is computerized, instructors are required to assign a letter grade for all students. Therefore, it is EXTREMELY IMPORTANT that you drop the class before the drop date so you won't receive an "F" on your transcripts. The drop date can be found in the college schedule.

E. **Withdrawal:** Students must officially withdraw from courses in a manner approved by the college. Failure to withdraw properly *before the deadline* may result in an "F" grade. Consult an Official College Calendar for the last withdrawal date.

F. **Quizzes and homework:** Unannounced quizzes and homework may be given *frequently*. No make-up quizzes will be allowed without prior authorization and no homework will be accepted after its assigned due date. One quiz/homework grade will be dropped in calculation of final grade.

G. **Safety:** Students will be expected to promote a safe study and work environment. Everyone will adhere to prescribed safety procedures and follow basic electrical work and fall protection standards. Students will dress appropriately for lab and construction environments and will not be allowed to participate in activities if/when safety is compromised.

H. **Emergency Procedures:** Students should become familiar with the school's emergency procedures and classroom safety rules.

I. **Late Assignments:** You will be assigned due dates for all homework. In order to receive 100% credit for your graded work, you must turn in the assignments by the assigned due date. ***If you must be absent on the day of a presentation***, you must contact me in advance or as soon as possible and be prepared to submit written verification of your absence (i.e. doctor's note). ***If you must be absent on the date a written assignment is due,*** the assignment can either be turned in by the student or friend or fellow student, sent through the U.S. mail, or e-mailed to me. Late work must be made up within one week of the original due date, but will be automatically downgraded by 25%. Make-up work past this point will not be accepted, and will receive no grade.

J. **Incompletes:** On rare occasions, students need to request an incomplete grade for the semester. They are granted for unforeseeable, emergency, and justifiable reasons at the end of the academic term. (Typically, the student has accomplished at least 80% of the coursework for the semester.) If you encounter such a situation, contact me as soon as possible, and you will need to complete the appropriate paperwork available from Admissions and Records.

K. **Code of Conduct:** This course has opportunities for hands-on lab work with partners or in teams. You will be expected to handle yourself with the same professional conduct and courtesy that would be required of you by any employer or on any jobsite – in both the classroom setting, as well as the lab. Your professionalism, conduct and communication with fellow employees and your employer is an extremely important element of your future success in this industry.

Final Comments – My Objective:
This instructor has a goal to provide equal opportunity for success for all students. If you feel a learning disability might influence your successful completion of this course, please request a conference with the instructor during the first two weeks of the semester.

This instructor is pleased to accept suggestions regarding ways the class, labs, lectures, etc. may be made more fun, interesting, meaningful, and/or useful. Even though the essential content and required effort of the course cannot be diminished, all such suggestions will be carefully considered.

As your instructor, it is my objective to teach you the material in a dynamic and positive environment, as well as from personal first-hand experience. I like to teach in a synergistic and solution-oriented style. Your own motivation will help you succeed and excel in this class. I wish you the best for this semester.