Sierra College
Environmental Studies & Sustainability
Division of Sciences & Mathematics

Fall 2013

SYLLABUS

COURSE TITLE: **Beginning Photovoltaic Systems**
ESS 30

INSTRUCTOR: **Steve Geiger**
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REQUIRED TEXT: **Photovoltaic Systems (Third Edition), by James P. Dunlop, PE and the National Joint Apprenticeship and Training Committee (NJATC),** American Technical Publishers, (ISBN-10: 0826992277 | ISBN-13: 978-0826992277)

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

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

COURSE DESCRIPTION:
Introduction to photovoltaic concepts, applications, and the solar energy industry. Includes basics of electricity, load estimation, energy efficiency, solar site surveying, photovoltaic system components, sizing, financial analysis, design, installation, and maintenance. This course taken with ESS 32 prepares students to sit for the NABCEP PV Entry Level Certificate of Knowledge exam.

COURSE OBJECTIVES:

Objectives – Lecture:

1. Compare and contrast the power and energy consumption of common electrical appliances in the home and business.
2. Outline the proper safety procedures and precautions required in the photovoltaics field.
3. Compute simple series and parallel electrical circuit values.
4. Analyze average solar irradiation on various surfaces.
5. Evaluate the potential for solar energy at a site.
6. Assess array and inverter size for grid-connected system, associated peak power output (AC and DC), and estimated monthly and annual energy output.
7. Outline common adaptations to the mechanical design of photovoltaic systems for site-specific physical constraints.
8. Outline common adaptations to the electrical design of photovoltaic systems to satisfy local codes and standards.
9. Outline typical photovoltaic system performance problems and associate with typical causes.
10. Analyze simple financial payback of photovoltaic systems with consideration of utility and government incentives.

Objectives – Lab:

1. Evaluate the maximum power and average daily energy consumption of a plug-in appliance.
2. Differentiate safety hazards of photovoltaic systems and necessary practices along with protective equipment for their installation and maintenance.
3. Develop a routine to follow electrical wiring and safety protocols to construct a circuit of modules.
4. Assess basic solar movement and effect of earth tilt.
5. Create a shading analysis report for a potential photovoltaic array site.
6. Evaluate the function and application of common components of photovoltaic systems.
7. Outline and follow procedures for a simple home rooftop photovoltaic array installation.
8. Outline and follow procedures for a single phase photovoltaic system grid interconnection.
9. Compare actual photovoltaic system power output to expected output.
10. Design, construct, and document a simple photovoltaic system.

VI. PERFORMANCE CRITERIA:

Exams: Two exams worth 100 points each		200
Student Project		100
Lab Activities		300
Quizzes		100
Homework		200
Class Participation		100
Instructor's Evaluation	(+/-)	
(of student participation & class contribution)		
Total Points		**1000**

Course Grade	Point Range
A	900 -- 1000
B	800 -- 899
C	700 -- 799
D	600 -- 699
F	Less than 600
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, labs, quizzes, 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; you will need to either contact me and let me know your intentions, or go to the Admissions and Records office and complete the drop procedure. **I will not drop you from the class without your telling me to do so.**

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.