



## IMPERIAL VALLEY COLLEGE

### Class Syllabus

Fall 2013

<b>Class title:</b>	<b>RNEW-150 Solar Energy Systems PV1</b>
<b>Instructor:</b>	<b>John Fahim</b>
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<b>Classroom</b>	<b>1307</b>
<b>Laboratory:</b>	<b>1307</b>

#### **Class Schedule:**

Saturday 08:25 AM – 01:45 PM, August 24 to December 07, 2013

#### **Course Description:**

This course provides students with instruction in the principles of photovoltaic (PV) technology that meets NABCEP guidelines, and qualifies the student to take the NABCEP Solar PV Entry Level Exam. Instruction includes an overview of electric principles, the solar resource, and electric load analysis; (PV) modules, controllers, batteries, and inverters; (PV) systems utility-interactive systems, integrating (PV) into buildings and system applications, basics of installation, maintenance, troubleshooting, and safety.

#### **Student Learning Outcomes (SLO)**

Upon course completion, the successful student will have acquired new skills, knowledge, and or attitudes as demonstrated by being able to:

1. Identify the laws of solar energy, its effects and understand electrical power generation from solar energy. (ILO2, IL3)
2. Explain the photovoltaic systems principles, applications, configurations, components, functions and sizing. (ILO1, ILO2)
3. Understand photovoltaic systems protection, disconnects, grounding, installation, maintenance and troubleshooting utilizing National Electrical Code. (ILO2, IL3)

#### **Institutional Student Learning Outcomes (ISLO)**

Student learning outcomes are written statements that represent faculty and departmental learning goals for students. After successful completion of the program or degree at Imperial Valley College, students are expected to have measurable improvement in the following areas:

- ISLO 1: Communication Skills
- ISLO 2: Critical Thinking Skills
- ISLO 3: Personal Responsibility
- ISLO 4: Information Literacy
- ISLO 5: Global Awareness

## **Lecture & Laboratory Course Goals and Objectives:**

Upon successful completion of this course, the student will be able to:

1. Explain and apply OSHA safety and health standards, policies and procedures for general industry.
2. Locate orientation and declination of the sun for different seasons of the year using national geophysical data center maps.
3. Compare the advantages and disadvantages of photovoltaic technology.
4. Explore the advantages of passive solar home design.
5. Perform load estimates using electrical load requirements use national electrical code.
6. Explain series and parallel circuits in power sources and electric loads.
7. Explain the photovoltaic principles of photovoltaic arrays.
8. Describe battery specifications, types, operations and sizing.
9. Identify controller types, features and sizing.
10. Investigate inverters operating principles, features, efficiency, types and sizing.
11. Explain Grid-tied, net-metering of a utility interactive-photovoltaic system.
12. Describe the operation of a hybrid system with generators.
13. Explore photovoltaic system installation, protection, disconnects, and grounding utilizing National Electrical Code.
14. Troubleshoot photovoltaic wiring problems using a multimeter and OHM's law.

## **Attendance and Grading Criteria:**

1. Attendance: Regular attendance in all classes is expected of all students enrolled. All students must have an acceptable explanation for every day of absence and or tardiness.
2. Maximum absences limit is more than two classes' absences after the close of registration (Aug. 31, 2013).
3. A student may exclude (drop) him / herself from further attendance in a class during the semester when absences, after the close of registration (Aug. 31, 2013) and before (Nov. 09, 2013), have exceeded the above maximum absences limit.
4. Tardiness: Non-acceptable three times' tardiness equals to one absence.
5. Student Conduct: Upon entry into IVC constitutes the student's acceptance of the standards of student conduct and the regulations published by the college.
6. Each student is responsible for making up schoolwork missed because of absences. Students may receive the full grade for made-up schoolwork only for valid acceptable absence reason. For no show no call absence, students may receive class schoolwork points multiplied by attendance percentage.
7. Grading system:
  - A=90%-100% of points= Excellent
  - B=80%-89% of points= Good
  - C=70%-79% of points= Satisfactory
  - D= 60%-69% of points= Pass, less than satisfactory
  - F= Less than 60% of points= Failing
6. Exams:
  - **Mid-Term** (60 points) will be given on Oct. 12, 2013.
  - **Final-Exam** (60 points) will be given on Dec. 07, 2013.

- There are no make-up exams unless you have a valid acceptable reason and make arrangements with the instructor before the exam.
- **Final grades can be raised or lowered based on your attendance, preparation and participation in class. It benefits you to be engaged and participative.**

**Grades:**

	Points
Book worksheets, quizzes.	140
Lab activity, hands-on worksheets and Fieldtrips.	240
Attendance percentage will be applied to the above points	Percentage of above Points
Mid-term	60
Final-exam	60
Total points	500

**Course Grade:**

The course grade is based on total points accumulated during the semester. There is a total of 500 points available. Grades are determined by dividing the total points you earn by the total points available to get your percentage. (Total points may vary if we change the assignments in a particular week).

**Grading of Hands-on Assignments:**

The most common problem students experience is not being detailed enough in their answers and not spending the right amount of time in the lab procedures. Always be as specific as you can and use examples from your readings. Make sure to answer all parts of the questions. Points will be deducted for inadequate responses. Feedback will be given after each assignment and, hopefully, you will improve as you proceed with the course. The following grading rubric is used when grading assignments.

	Grading Rubric for Hands-on Assignment	Points
A	Focused and clearly organized. Contains critical thinking and content analysis. Convincing evidence is provided to support conclusions. Ideas are clearly communicated. Clearly meets or exceeds assignments requirements.	18-20
B	Generally focused and contain some development of ideas, may be simplistic or repetitive. Evidence is provided which supports conclusions. Meet assignments requirements.	16-17
C	May be somewhat unfocused, underdeveloped, or rumbling. But does have some coherence. Some evidence is provided which support conclusions. Meets minimum assignment requirements.	14-15
D	Unfocused, underdeveloped. Minimal evidence is used to support conclusion. Does not respond appropriately to the assignment.	12-13
C	Minimal effort by the student. Unfocused, underdeveloped. Evidence is not used to support conclusion. Block overall understanding. Does not meet assignment requirements.	0-11

**Method of Instruction:**

Methods of instructions may include, but are not limited to, the following: lectures, textbook worksheets, hands-on worksheets, internet readings, large and small group discussions, audiovisual aids, and demonstrations.

**Student Responsibility:**

1. Participate in class; turn in all your completed assignments to the instructor. Must follow safety rules at all times in the lab area.
2. Scantron answer sheets and #2 pencils on test days.
3. If you are having trouble with the course and/or personal problems, communicate with the instructor, as soon as possible to get the help needed.
4. If you have any form of disability, please inform the instructor so that you can get the assistance you may need. Please contact DSPS office as soon as possible: 355-6312, 2100 Bldg. We have made every effort to ensure that this course is accessible to all students, including students with disabilities. If you encounter any problem during this course, please contact me immediately.
5. Please, no food, smoking, or visitors during class.
6. Anyone using a cell phone/pager or other communication device, or carrying a device that makes noise, during class will be asked to leave and will receive only partial points. Please refer to IVC catalog for more information.
7. Students have the right to experience a positive learning environment; students who disrupt that environment can be asked to leave the class. Please refer to IVC catalog for more information. Swearing, put downs and discriminatory statements will not be tolerated. If someone says anything to you that may make you feel uncomfortable or that you feel it is inappropriate, contact your instructor immediately.

**Lab Rules and Regulations:**

Every student must follow safety standards according to the OSHA safety procedures *at all times during lab practice*.

**Nondiscrimination & Sexual Harassment Policy:**

IVC does not discriminate in the admission nor in the offering of programs and activities because of ethnic group identification, national origin, religion, sex, age, race, color, medical conditions, Vietnam era status, ancestry, sexual orientation, marital status, or physical or mental disability or because he or she is perceived to have one or more of those characteristics. (Refer to IVC catalog).

**Textbooks:**

Solar Energy International (2012). Solar Electric Handbook: Photovoltaic Fundamentals and Applications New Society Publishers. ISBN: 13: 978-1256701668

### Course Instructional Schedule and Learning Activities:

Date	Objectives
August 24	<ul style="list-style-type: none"><li>• Class Outline and Rules</li><li>• Class Safety Unit 7 Ch. 18</li></ul>
August 31	<ul style="list-style-type: none"><li>• Class Safety Unit 7 Ch. 19</li><li>• The Case for Renewable Energy Ch.1</li></ul>
September 07	<ul style="list-style-type: none"><li>• Overview of Solar Photovoltaic Ch.2</li><li>• Basics of Electricity Ch.3 A</li><li>• Lab1 Testing Electric Circuits</li></ul>
September 14	<ul style="list-style-type: none"><li>• Solar system components Ch.4</li><li>• Lab2 System Configuration</li></ul>
September 21	<ul style="list-style-type: none"><li>• Photovoltaic Modules Ch.5</li></ul>
September 28	<ul style="list-style-type: none"><li>• Series &amp; Parallel modules connection Ch.6-A</li><li>• Lab3 Testing Modules with Multi-meter Ch.7-A</li></ul>
October 05	<ul style="list-style-type: none"><li>• Series &amp; Parallel modules connection Ch.6-B</li><li>• Lab4 Testing Modules with Multi-meter Ch.7-B</li></ul>
October 12	<ul style="list-style-type: none"><li>• Mid-Term</li></ul>
October 19	<ul style="list-style-type: none"><li>• Solar Site Analysis Ch.8</li></ul>
October 26	<ul style="list-style-type: none"><li>• Mounting Ch.9</li><li>• Roofing Systems Ch.10</li></ul>
November 02	<ul style="list-style-type: none"><li>• Grid-tied Training1</li></ul>
November 09	<ul style="list-style-type: none"><li>• Grid-tied Training2</li></ul>
November 16	<ul style="list-style-type: none"><li>• Fieldtrip</li></ul>
November 23	<ul style="list-style-type: none"><li>• Final Review</li></ul>
December 07	<ul style="list-style-type: none"><li>• Final Exam</li></ul>

Fieldtrip and training are being scheduled and may cause changes to the above **Course Instructional Schedule**.

#### **In Case of Emergency:**

If you have a life-threatening illness or injury that requires an ambulance, **call 911 immediately**. Emergency costs are not covered by Student Health Services.

The Student Health Fee allows the students to receive health services on campus and at various health centers in the community. For more information refer to catalog.