

Viewpoints in Environmental Studies: Solar Energy Basics – ENVI F150

University of Alaska Fairbanks | Bristol Bay Campus
Spring 2021 (Mar. 17 - Apr. 14) 1 credit

Instructor Information

Name: Mark Masteller
Email and Phone: mamasteller@alaska.edu, 907-414-0198
Office Location and Hours: Call or email for an appointment.

Course Meeting Information

Dates: March 17 – April 14, 2021 **Day and Time:** Wednesday, 5:20-8:00pm
Class Location: Online (synchronous) via Blackboard Collaborate

Course Description

Presents basics of utilization, design and installation of solar energy systems, including both solar electric (photovoltaic) and solar hot water (thermal) systems. The material emphasizes residential-scale systems, but most principles apply to larger applications as well. Introduces basic physics related to solar energy, ways of harvesting solar energy, system components, design and sizing considerations, energy storage, installation options, cost/benefit considerations, career opportunities, and safety.

Course Prerequisite/Co-requisites: None – students do not need to have any previous knowledge.

Required Text and Learning Materials: *A Solar Design Manual for Alaska, 5th ed.* (2018). C. Pike and A. Nash, eds. UAF Cooperative Extension Publication EEM-01255. Available free as a PDF download via:
<http://cespubs.uaf.edu/publications/?cat=&s=solar+design+manual>

Other materials provided by instructor include:

- Solar Insolation table, exercise and review worksheets
- Various readings (provided either in hardcopy and/or electronically on Blackboard)

Optional Resources:

Chiras, D. (2010) *Solar Electricity Basics: a green energy guide*. New Society Publishers. ISBN-13: 978-0-86571-618-6.
Ramlow, B., & Nusz, B. (2010). *Solar water heating – revised and expanded edition: A comprehensive guide to solar water and space heating systems* (Expanded ed.). Gabriola Island, Canada: New Society. ISBN 978-0865716681.

Student Learning Outcomes: In this class, learning requires partnership. For each hour spent in class, plan to spend at least two hours studying outside of class each week. At the end of this course, if you actively engage in class, study outside of class, complete assignments and prepare for exams, you will be able to:

1. Describe the basic uses, differences and similarities between solar electric and solar hot water systems
2. Describe the primary components, and their functions, of both solar electric and solar hot water systems
3. Consider the benefits and costs of solar energy systems for use in specific locations
4. Explain the relationship of energy efficiency measures and solar energy system(s) development
5. Describe the general design and installation considerations important when considering solar energy systems
6. Discuss general solar energy system operation, maintenance, and safety considerations
7. Describe career opportunities related to the solar energy industry

Instructional Methods

This course will include lectures, discussions, homework, readings, and handouts. Classroom demonstration may be possible in some course formats.

Grading

This class is graded on a Pass-Fail scale. Grading will be based upon a percentage of the total points earned for quizzes, homework and attendance. You must achieve a score of 70% or better to pass. Your grade will be determined as follows:

Attendance and participation.....25%

Students are expected to attend all sessions and actively participate in group discussions

Class exercises and review	50%
Homework assigned as needed.	
Final Exam	25%
Exam will be open book, open notes and will cover all material presented in the course.	

Assignments and Course Schedule

The instructor reserves the right to change the assignment requirements and exam dates depending upon class progress. Assignment due dates are shown on the course schedule.

Course Policies

Classroom Rules

1. Students are expected to comply with the UAF Student Code of Conduct: <https://uaf.edu/deanofstudents/student-code-of-conduct/>
2. Cellphones are to be turned off and put away. Do not take them out during class. If used, laptops and tablets may only be used to take notes.
3. Be on time. Late entrances disrupt others.
4. No eating in class. Beverages in closed containers are acceptable.
5. Please respect the rights of others to learn. Behaviors that distract attention from lecture or class activities will not be tolerated. Conduct that unreasonably interferes with the learning environment or that violates the rights of others is prohibited by the standards and guidelines collectively described as the UA Student Code of Conduct.
6. No children, pets, or guests are permitted to attend class.

Attendance

Regular attendance is necessary for success at the collegiate level. You are expected to actively participate in all classroom sessions. Make sure that you are prompt and that you stay for the scheduled class time. Experience has shown that due to the time constraints of this course your grade will be jeopardized if you are absent from class.

Blackboard

Blackboard will be used for announcements and posting of your grades.

University Policies and Services

Academic Integrity

Academic integrity is a basic principle that requires that students only take credit for ideas and efforts that are their own. Cheating, plagiarism, and other forms of academic dishonesty are defined as the submission of materials in assignments, examinations, or other academic work that is based on sources prohibited by the faculty member. Substantial portions of academic work that a student has submitted for a course may not be resubmitted for credit in another course without the knowledge and advance permission of the instructor. For more information, refer to the UAF Student Code of Conduct: <https://uaf.edu/deanofstudents/student-code-of-conduct/>

Student Protections and Services

Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc. to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/.

Course Outline

NOTE: The instructor reserves the right to change the assigned readings, homework, and exam dates based upon class progress and student need for more practice on specific concepts.

General Schedule (Instructor reserves right to alter schedule as needed)

2020-11-02

Course Content
Part 1 - Course goals & objectives, syllabus, introductions, expectations, goals, resources Part 2 - Understanding the Sun and Solar Energy Part 3 – Solar Electric (PV) Technology Basics Part 4 – Types of Solar PV Systems, and Balance of System Part 5 – Assessing Demand & Sizing Your PV Array Part 6 – Types of Solar Hot Water Systems, and Balance of System Part 7 – Economic Assessment Part 8 – Mounting a Solar Array for Maximum Output, and solar measuring tools Part 9 – Planning, regulations, safety, operations and maintenance Part 10 – Careers and Industry trends Part 11 – Case Studies
Activities and assignments
Review sessions after most sections Class exercises: <ol style="list-style-type: none">1. Direct-Diffuse Radiation2. Tilt Angle3. Design project site plan4. Design project array sizing and energy production5. Safety Final Exam
Handouts provided for class: Reading Materials <ul style="list-style-type: none">• <i>Direct-Diffuse Radiation (Home Power 136)</i>• <i>Urban to Rural (Home Power 133)</i>• <i>Module-Level Performance (Home Power 163)</i>• <i>ACEP Solar Hot Water pamphlet</i>• <i>Heat Your Water With The Sun – DOE-EERE</i>• <i>Solar Hot Water – Fine Homebuilding Magazine 2008</i> Miscellaneous <ul style="list-style-type: none">• Solar Insolation table• Electric load analysis worksheet• Array sizing worksheet