

EGR 255

Sustainable Resource Engineering & Design Spring 2021



Monday and Wednesday 12:30 – 1:50 H110

(Zoom: <https://etown.zoom.us/j/98547554130>).

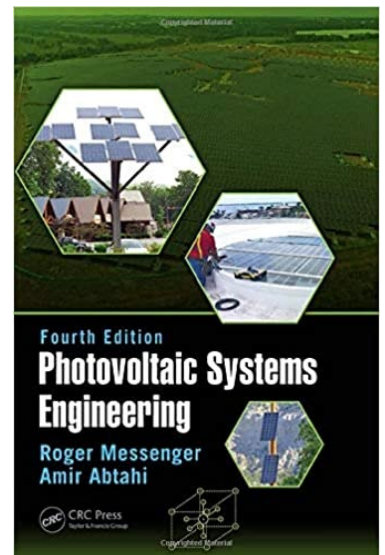
Instructor: Dr. Kurt DeGoede, Ph.D., Professor of Physics & Engineering

Office: Dr. DeGoede E160E; Zoom: <https://etown.zoom.us/j/2463626974>

Office Hours: M Tu W Th 2:00-3:20; or by appointment. Please feel free to stop by my office anytime, if I am not available please leave a note on the whiteboard.

Contact Info: Office 717-361-1380; Cell (text msg only): (717) 419-9568, before 10:00 PM (no messages between 1:00 PM Saturday and 4:00 PM on Sunday please). Email: degoedek@etown.edu

Textbook: Messenger, R.A., & Abtahi, A. (2017). *Photovoltaic Systems Engineering* (4th ed.). CRC Press. Print ISBN: 9780367736330, eText ISBN: 9781498772785



Supplemental Resources through High Library:

Gevorkian, Peter Ph.D., PE. *Sustainable Energy Systems Engineering: The Complete Green Building Design Resource* (McGraw-Hill Education: New York, Chicago, San Francisco, Athens, London, Madrid, Mexico City, Milan, New Delhi, Singapore, Sydney, Toronto, 2007).

<https://www-accessengineeringlibrary-com.proxy-etown.klnpa.org/content/book/9780071473590>

Labouret, Anne Viloz, Michel. (2010). *Solar Photovoltaic Energy*. Institution of Engineering and Technology. Retrieved from <https://app.knovel.com/hotlink/toc/id:kpSPE00006/solar-photovoltaic-energy/solar-photovoltaic-energy>

McPartland, Hartwell and McPartland. (2011). *NEC Code Handbook*. McGraw Hill. Article 690: https://accessengineeringlibrary.com/browse/mcgraw-hills-national-electrical-code-2011-handbook-27th-edition/ch9780071745703_06lev1sec22#ch9780071745703_06lev1sec22

Tyler G. Hicks, P.E.,. *Handbook of Energy Engineering Calculations* (McGraw-Hill Education: New York, Chicago, San Francisco, Lisbon, London, Madrid, Mexico City, Milan, New Delhi, San Juan, Seoul, Singapore, Sydney, Toronto, 2012). <https://www-accessengineeringlibrary-com.proxy-etown.klnpa.org/content/book/9780071745529>

Course Description

Engineering and design practices to make use of natural resources such that environmental impacts are minimized and benefits to human civilization are maximized: survey of renewable energy systems. Design of sustainable energy systems: design of complete photovoltaic systems for grid-tied and off-grid applications.

Course Objectives & Student Learning Outcomes

Course Objectives (ABET outcomes in parentheses)

1. Develop an understanding the environmental and natural resource context for sustainable engineering practices. (4, 7)
2. Students will design a grid tied PV system for a US residence within appropriate constraints. (1, 2, 7)
3. Students will design a standalone PV system for a developing world application within appropriate constraints. (1, 2, 7)

Grades will be determined based on the following:

Project A: Solar Resource Modeling	4 points
Project B: Grid Tied Design	8 points (4x2)
Project C: Global Energy	8 points (4x2)
Project D: Off-Grid Design	8 points (4x2)
Project E: Costing	4 points
Quizzes A, B, D, & E	4 points each (16 points total)
Individual assessments: Assessed with 0.5-point increments (0.0:0.5:4.0)	
1: Demonstrates some proficiency (D/D+)	
2: Demonstrates CORE proficiencies (C/C+)	
3: Approaching Mastery (B/B+)	
4: Mastery (A)	

Semester Grade:

Points	Grade	Average
44.00+	A	>3.67
40.00-43.99	A-	>3.33
36.00-39.99	B+	>3.00
32.00-35.99	B	>2.67
28.00-31.99	B-	>2.33
24.00-27.99	C+	>2.00
20.00-23.99	C	>1.67
16.00-19.99	C-	>1.33
12.00-15.99	D+	>1.00
8.00-11.99	D	>0.67
4.00- 7.99	D-	>0.33

Outline of Topics

Date/Session			Topics	Read	Project Due
Jan	25	1	Introduction to PV systems	Ch 1	
	27	2	Solar Radiation	Ch 2	
Feb	1	3	Work Day		
	3	4	Modules and Inverters	Ch 3.1-3.4, 3.8.4	A
	8	5	Grid tied system sizing	Ch 4.3	
	11	6	Grid tied system matching		
	15	7	Wiring	McPartland; Ch 3.10, 4.2, 4.4	b
	17	8	Finalizing the Design		
	22	9	Field Trip I	Ch 4.8	
	24	10	Quiz Day: A and B		
Mar	1	11	Other Sustainable Energy Systems	Drawdown & Gevorkian	B
	3		NO CLASS – Study Break		
	8	12	Mega Watt Game	Game Materials	
	11	13	Externalities	Ch 9	
	15	14	World Energy I Simulation	Game Materials	
	17	15	World Energy II		
	22	16	Batteries/ Charge Controllers	Ch 3.5, 3.8	c
	24	17	Stand Alone Systems and Loads	Ch 3.7, 7.8.1-2	
	29	18	Field Trip II		d
	31	19	Off-Grid System Design	Ch 7.7.3-5, 7.8.3-7	
Apr	5		NO CLASS – Fri Schedule		
	7	20	Pumping Water		
	12	21	Quiz Day: D (retakes for A/B)		
	14	22	EGR Economics I	Ch 8	D
	19	23	EGR Economics II		
	21	24	EGR Economics III		
	26	25	Cost analyses for your PV Projects		
	28	26	Quiz Day: E (retakes for D)		E
May	3	27	Hydro – Wind Presentations		C
	5	28	Biomass – Geothermal Present's.		C
	10	FE	Finite resource simulation (Retakes for Quiz E)	11 AM – 2 PM	cc

Ethics: Students are to act in accordance with the Pledge of Integrity ([Etown College Integrity Statement](#)):

I pledge to respect all members of the Elizabethtown College community, and to act as a responsible member of the College community. I pledge to respect the free exchange of ideas both inside and outside the classroom. I pledge to represent as my work only that which is indeed my own, refraining from all forms of lying, plagiarizing, cheating, and academic dishonesty.

As members of the Elizabethtown College community, we hold each other responsible in the maintaining of these values.

and the NSPE code of ethics (Cannons attached, with Etown Engineering Professional Obligations).

Students will be asked to reaffirm their commitment to the pledge and the code with their signature on each exam. Dishonest practice can result in failure of the course and possibly expulsion from the college.

All work should represent each student's individual efforts. **Students are encouraged to discuss assignments with other students and/or the instructor, however submitted assignments should reflect the student's own work and understanding.** Any solution obtained from any source should be properly referenced.

All **quizzes and exams** will be taken using only the provided data/equation packets and a calculator approved for use on the FE/PE exams (<http://ncees.org/exams/calculator/>). The use of any other electronic device (graphing calculators, cell phones, smartwatches, etc.) is strictly prohibited.

Assessments are to be taken without communication, except for problem clarification from the instructor. During testing, students are not allowed to access any resources beyond those explicitly permitted by the instructor, including but not limited to online materials and books/note/study guides. Students will not be permitted to leave the classroom (or their zoom window) during assessments. Exceptions will be granted at the professor's discretion.

Unethical behavior on any Project or Quiz will, at a minimum, lower the student's course grade by a full letter grade.

Re-Grading: Written requests, with full rationale, for re-grading of all course-work will be accepted the next class period after original materials are returned to the students.

Statements on Disability Services, Religious Observances, and COVID-Related Expectations:
[Link to Statements](#)

This course has been configured for in person, hybrid, on-line learning. We will continue the learning experience in whatever delivery model is required. Canvas materials are in place for all course topics.

Fine Print: The preceding information represents the *intent* of the course and is subject to change at the discretion of the instructor.

Elizabethtown Engineering Program Code of Ethics

- I. Hold paramount the safety, health, and welfare of fellow students.**
- II. Perform project tasks and assignments only in the areas of their competence.**
- III. Submit assignments only in an objective and truthful manner.**
- IV. Act for team members, instructors, or employers as faithful agents or trustees.**
- V. Avoid deceptive acts.**
- VI. Conduct themselves responsibly, ethically, lawfully, and in line with the integrity policy so as to enhance the honor, reputation, and usefulness of the profession and college's engineering department.**

Professional Obligations (Etown Engineering Students)

- 1. Engineering students shall be guided in all their relations by the highest standards of honesty and integrity.**
 - A. Be honest about your mistakes.
 - B. Do not cheat on exams or assignments.
 - C. Do not plagiarize or falsify data.
 - D. Do not aid or abet another student in unethical behavior.
- 2. Engineers shall at all times strive to gain the knowledge to serve the public's interest.**
 - A. Your goal in class should be to gain knowledge to justify your intended degree, not just to obtain a high grade.
 - B. Work for the advancement of society and the profession by engaging in the community, and recruiting youth to the engineering profession.
 - C. Inform professors of unethical requests from other students.
- 3. Engineers shall avoid all conduct or practice that deceives other students, instructors, or the public.**
 - A. In lab work, be truthful with ALL data, even if it is not favorable.
 - B. All assignments should be your own original work unless otherwise noted.
 - C. Do not finish and submit team projects without the approval of ALL your other team members.
- 4. Engineers shall not disclose confidential information concerning their own group work to any person outside of their group except for the professor.**
 - A. Do not put individual assignments in your public folder.
 - B. Do not spread the word of quiz questions or unannounced assignments to later sections of a course.
 - C. Engineering students who are or have been a TA shall not disclose information about tests and grades of other students.
 - D. Do not disclose or use information learned from the internships that have to do with processes, or techniques of production.
- 5. Engineering students shall not be influenced in their scholastic duties by conflicting interests.**
 - A. Do not attempt to receive a favorable grade or recommendation by establishing an unprofessional relationship with a professor.
 - B. In peer assessments or as a TA, do not allow friendships or grades to sway judgment
 - C. Do not attempt to gain favor in class or for assignments through flattery of professors.

6. **Students should not attempt to gain advancement by downgrading other students' work or by other questionable methods.**
 - A. Credit should be awarded where it is deserved when submitting group work.
 - B. If another student does exceptional work, do not take credit for it if it is not your work.
 - C. If another student is performing inadequate work, calmly confront them about it before addressing it to the professor.
 - D. Students shall not sabotage the projects or advancements done by other students.
 - E. Do not blame group members for their own behavior.
 - F. Do not blame professors or staff for their grades.
7. **Engineering students should not attempt to injure the reputation of the engineering department or the reputation of professors and engineers in the department.**
 - A. If other engineering students are injuring the reputation of the department, you should inform the head of the department or the professor of their actions.
 - B. Every student in the department's actions should coincide with the integrity policy of the college to avoid degrading the department.
 - C. Students shall report malicious activities to the Head of the Engineering Department, or appropriate instructor. Yet, the student shall not tell others of the issue.
8. **Engineering students should accept personal responsibility for all of the work they do for the department and for their group.**
 - A. Students shall act truthfully when accused of misconduct.
 - B. Blame for violations of the integrity policy should not be placed on the department or professors, but rather on the individual who committed them.
 - C. Students should also accept the blame if their group submits unethical work because it is their responsibility to ensure any submission with their name on it is held to high ethical standards.
9. **Engineering students shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.**
 - A. Students shall not steal programs or work from other engineers or students from the internet through illegal networks.
 - B. Students shall properly cite information in all manners of presentation such as research papers, essays, PowerPoints, etc.

*Obligations written by Etown Engineering students Class of 2021
Cannons adapted from: <https://www.nspe.org/resources/ethics/code-ethics>*