

Physics of Renewable Energy – Physics 576
Spring 2020
SUNY College at Cortland
Physics Department

Catalog Description

Physical principles of renewable electricity generation and storage. Topics include: monocrystalline, amorphous, and thin-film photovoltaic cells, advanced battery technologies, and residential and utility scale wind turbines. (3 cr. hr.)

Textbooks (Required)

The Physics of Solar Cells by Jenny Nelson, Imperial College Press ISBN:9781860943492.
Wind Energy Explained (2nd Ed.) by J.F. Manwell, J.G. McGowan, and A.L. Rogers, Wiley ISBN 9780470015001.

Instructor Information

Instructor: Douglas Armstead
Office: 127 Bowers (607) 753-2919
Office Hours: TR 1-2pm, F 9:30-10:30am and by appointment. (provisional)
Email: douglas.armstead@cortland.edu
Lecture meets: TR 2:50pm-4:05pm in Bowers 1120.
Course Website: <http://facultyweb.cortland.edu/douglas.armstead/F20/PhysicsOfRenewables.html>

Expectations

What you should expect from me:

- Explanations of concepts that include concrete examples and, where reasonable, demonstrations.
- In-class examples that help you to develop the level of reasoning that is necessary to do the problems you will encounter in the homework and analyze news articles.
- Careful and respectful consideration of your questions and contributions.

- An open door policy—if my office door is open you should feel free to come in and talk about physics. This is in addition to my regularly scheduled office hours listed above.

What I expect of you:

- Your presence in class, both physical and mental, for the entire class period.
- To prepare for class. This includes doing the reading at a level that you arrive with questions in hand about the material and are ready to discuss it.
- When you have a question, ask it. Your fellow classmates will thank you—if you are unclear on something, chances are the person next to you is, too.
- Careful and respectful consideration of your class mates questions and contributions.
- Submit work for grading that is your own. If you copy from another student or source and submit it for a grade, then you risk receiving an F in the course.

Grades

The final score for the class is tallied using the following percentages:

Midterm exam 1	25%
Midterm exam 2	25%
Problem Sets	25%
Final Exam/Project	25%.

Problem sets: Problem sets are an important part of learning this material and I will try to weight them accordingly. We will discuss this the first day of class. Allowing late homework is not really in your best interest and will generally not be accepted.

Midterm Exams: Midterm exams will be in-class and you will be allowed to bring one hand-written 3” x5” notecard.

Final Exam/project: The final exam will be cumulative (PV, Wind, Batteries). An individual student project of sufficient depth can be substituted for the final exam.

The score is mapped into a grade roughly as:

Final %	Grade
90-100	As
80-89	Bs
70-79	Cs etc.

Class Schedule

All dates are tentative.

Week of	Topic	Chapter
1/28	Introduction to Solar Photovoltaics	(Nelson Ch 1)
2/4	Basic Principles of the PV Effect	(Nelson Ch 2)
2/11	Semiconductor Physics-Introduction	(Nelson Ch 3)
2/18	Semiconductor Physics-Introduction	(Nelson Ch 3)
2/25	Electron-Hole Generation and Recombination	(Nelson Ch 4)
3/3	Electron-Hole Generation and Recombination	(Nelson Ch 4)
	Exam 1 (Ch 1-3)	
3/10	Semiconductor Junctions	(Nelson Ch 5)
3/17	Spring break	no class
3/24	P-N Junction Characteristics	(Nelson Ch 5,6)
3/31	P-N Junction Characteristics	(Nelson Ch 6)
4/7	Monocrystalline Solar Cells	(Nelson Ch 7)
4/14	Wind Characteristics and Resources	(Manwell, McGowan, Rogers Ch 2)
4/21	Aerodynamics of Wind Turbines	(MMR Ch 3)
	Exam 2 (Ch 4-7)	
4/28	Electrical Aspects of Wind Turbines	(MMR Ch 5)
5/5	Battery Storage	

Final Exam at 1:30-3:30pm on Friday May 15, 2019

Required Statements

Academic Integrity Statement

All students are expected to uphold academic integrity standards. Plagiarism is defined as taking the ideas of others and using them as one's own without due credit. Students who cheat in examinations, course assignments, or plagiarize in this course may be disciplined in accordance with university rules and regulations.

Disability Statement

As part of SUNY Cortland's commitment to a diverse, equitable, and inclusive environment, we strive to provide students with equal access to all courses. If you believe you will require accommodations in this course, please place a request with the Disability Resources Office at disability.resources@cortland.edu or call 607-753-2967. Please note that accommodations are generally not provided retroactively so timely contact with the Disability Resources Office is important. All students should consider meeting with their course instructor who may be helpful in other ways.

Diversity Statement

SUNY Cortland is dedicated to the premise that every individual is important in a unique way and contributes to the overall quality of the institution. We define diversity broadly to include all aspects of human difference. The College is committed to inclusion, equity, and access and thus committed to creating and sustaining a climate that is equitable, respectful and free from prejudice for students, faculty and staff. We value diversity in the learning environment and know that it enhances our ability to inspire students to learn, lead and serve in a changing world. We are committed to promoting a diverse and inclusive campus through the recruitment and retention of faculty, staff and students. As a community, we hold important the democracy of ideas, tempered by a commitment to free speech and the standards of inquiry and debate. To this end, we are dedicated to developing and sustaining a learning environment where it is safe to explore our differences and celebrate the richness inherent in our pluralistic society.

Inclusive Learning Environment Statement

SUNY Cortland is committed to a diverse, equitable and inclusive environment. The course instructor honors this commitment and respects and values differences. All students enrolled in this course are expected to be considerate of others, promote a collaborative and supportive educational environment, and demonstrate respect for individuals with regard to ability or disability, age, ethnicity, gender, gender identity/expression, race, religion, sex, sexual orientation, socio-economic status or other aspects of identity. In an environment that fosters inclusion, students have the opportunity to bring their various identities into conversation as they find helpful, but are not expected to represent or speak for an entire group of people who share aspects of an identity. If you have any questions or concerns about this statement, contact the Institutional Equity and Inclusion Office at 607-753-2263.

Title IX Statement

Title IX, when combined with New York Human Rights Law and the New York Education Law 129-B, prohibits discrimination, harassment and violence based on sex, gender, gender identity/expression, and/or sexual orientation in the education setting. The federal Clery Act and NY Education Law 129-B provide certain rights and responsibilities after an incident of sexual or interpersonal violence. When a violation occurs, victims and survivors are eligible for campus and community resources. Where the College has jurisdiction, it may investigate and take action in accordance with College policy. If you or someone you know wishes to report discrimination based in sex, gender, gender identity/expression, and/or sexual orientation, or wishes to report sexual harassment, sexual violence, stalking or relationship violence, please contact the Title IX Coordinator at 607-753-4550, or visit cortland.edu/titleix to learn about all reporting options and resources. (Updated by SUNY Legal Feb. 1, 2018).