


<p>THE PHYSICS OF SOLAR AND RENEWABLE ENERGY (PHYSICS 161)</p> <p>SPRING 2021</p>	<p>PROFESSOR RAGHUVVEER PARTHASARATHY (Par-tha-sa-ra-thē)</p> <p>Office: 362 Willamette Hall EMAIL: raghu@uoregon.edu</p>
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SYLLABUS

Welcome to “The Physics of Solar and Renewable Energy!” This syllabus has a lot of detail on many components of the course that we’ve constructed to help you learn, and to make the term run smoothly.

– Prof. Parthasarathy

INSTRUCTORS AND LOGISTICAL INFORMATION

CLASS TIMES	TuTh 12:15 - 1:45 pm, REMOTE (via Zoom – see Canvas for the link)
INSTRUCTOR	Professor Raghuvveer Parthasarathy (Par-tha-sa-ra-thē) Email: raghu@uoregon.edu Office: 362 Willamette Hall, and Zoom
TEACHING ASSISTANTS	This course has one graduate student teaching fellows (GTF): Clark Embleton – cemblet2@uoregon.edu
OFFICE HOURS	We’ll hold office hours by Zoom using the regular class Zoom link. Prof. Parthasarathy: Wed. 12:30-1:20 pm, Thurs. 2:00-2:50 pm [<i>Week 1 only:</i> W 12:30-1:20 pm, Fr 9:00-9:50 am] Clark Embleton: Mon. 1:30-2:20pm, Fri. 1:30-2:20pm Make use of office hours! Even if you don’t have specific questions, feel free to drop by and chat. <i>Office hour times may change</i> , both by request (if particular times are not good for many students) and due to scheduling conflicts that arise.
EMAIL	Email: You can certainly ask questions of me and the GTF by email! I almost always respond within 24 hours. I might not respond to emails that begin “Hey...” or are otherwise poorly constructed. Please call me “Prof. Parthasarathy” in communications.
	As part of the Science Literacy Program (SLP) , we will pay special attention to connections between science, societal issues, and “big ideas.” SLP courses include courses for non-science majors and science majors taught by teams of faculty, graduate fellows, and undergraduate scholars, who will include opportunities to engage with topics through a variety of activities. For more information about the program see scilit.uoregon.edu

COURSE DESCRIPTION

TOPICS AND AIMS

Modern civilization uses vast amounts of energy in forms that are unsustainable and environmentally damaging. What are our alternatives? How do alternative energy sources work, and how much of our needs can they satisfy?

We'll explore these questions, investigating the science behind harnessing energy and putting "real numbers" into our characterization of it. Why? It's easy to have good intentions about energy and the environment, but good intentions without quantitative analysis isn't enough to guide important decisions, and it can often do real harm.

Who are you? Being in this course, it's likely that you care about energy issues. Being university students, it's likely that you'll be the decision-makers of the future – businesspeople, policy makers, or at least voters – who will be faced with complex choices having to do with energy and society. The course is designed for **non-science majors**, and we'll develop the ability to make deep insights with simple math.

We'll examine a variety of topics:

1. Present Energy Usage and Sources
2. The Physics of Energy, Power, and Energy Conversion
3. Hydroelectric Power
4. Wind Power
5. Generating and Transporting Electricity
6. Thermodynamics and its Consequences
7. Geothermal and Solar Thermal Energy
8. Solar Photovoltaics (Solar-Powered Electricity)
9. Biofuels
10. Nuclear Power
11. Batteries and Storage

We'll very briefly comment on fossil fuels and climate change, which are discussed at length in **Physics 161** (Physics of Energy and the Environment). Physics 161 **is not** a prerequisite for 162.

Other goals: We will develop our abilities to think critically and quantitatively about scientific issues. Science, contrary to what you may have been mis-taught in the past, is not about "learning facts" but rather about learning how to investigate and draw logical conclusions. We'll practice this!

LEARNING OUTCOMES

Students completing the course will have enhanced their abilities to:

- Understand how physical principles underlie how we use energy.
- Assess and interpret graphs and quantitative data.
- Understand the process by which science generates knowledge.

COURSE MATERIALS AND COMPONENTS

CANVAS

We will be using Canvas in this course extensively to distribute and collect course materials. Log on to canvas.uoregon.edu using your DuckID to access our class. If you have questions about accessing and using Canvas, visit the [Canvas support page](#). Canvas and Technology Support also is available by phone or live chat: [541-346-4357](tel:541-346-4357) | livehelp.uoregon.edu

	If you face Internet access challenges, visit Information Services' web page on going remote .
ZOOM	Students will be expected to participate in class Zoom sessions by sharing ideas and contributing to the collective learning environment. Additional guidance will be provided on Canvas. Please turn your video on if possible; this isn't required, but it helps make the class livelier and more engaging. Our Zoom classes will be recorded and posted on Canvas so that students can study them.
TEXTBOOK	There is no required textbook. The lectures plus supplemental readings will be sufficient. (See also "Reading Quizzes.") We'll use parts of <i>Sustainable Energy – Without the Hot Air</i> by David MacKay, a remarkable book that quantifies a lot of energy-related issues. It's available free online, at http://www.withouthotair.com/ .

ASSIGNMENTS AND ASSESSMENTS

PHILOSOPHY	I'm fond of having a variety of tools for fostering and assessing student learning, rather than just one or two high-stakes exams. (There's a lot of educational research literature that supports this approach.) There are therefore a lot of components to the coursework.
READING QUIZZES	Reading assignments will precede most classes and will often have required "reading quizzes" associated with them. Some of these will be videos. Each student's lowest reading quiz score will be dropped from the overall total.
POST-CLASS NOTES	Briefly reviewing what one learned from a class session helps cement one's understanding. Within 24 hours of the end of each class, submit a short (about 200 words) summary of what the key points of that day's class were. You can also describe things that were unclear or that need further explanation. These will be submitted via Canvas. The notes will be graded on clarity and content (i.e. that they capture important aspects of the day's lessons). We'll give examples of good and bad notes. I will rescale the grades of the post-class notes at the end of the term such that 90% becomes 100%. (In other words, I will divide each student's percentage by 0.9, with a ceiling of 100%. If your original score were 75%, the rescaled score would be 83%.)
QUIZZES	There will be several short quizzes. (They won't be surprises; you'll get advance notice of at least one class.) We'll use these to assess understanding of key points without the heavy weight of an exam. Each student's lowest quiz score will be dropped from the overall total. There won't be any make-up quizzes; if you miss one, this will be the quiz dropped from your overall grade calculation.
HOMEWORK	There will be homework assignments approximately every week. Feel free

	<p>to discuss the questions with others, but of course, <i>the work you submit should be your own</i>. Assignments will be submitted online, via Canvas. Solutions will be posted – study these. <u>No late homework will be accepted</u>.</p> <p>Some assignments will involve finding and analyzing data. You should be able to navigate the internet and make graphs (e.g. with Excel).</p> <p><i>Homework grading:</i></p> <p>(1) Each student’s lowest score will be dropped from the overall total.</p> <p>(2) We will not comment in detail on your homework when grading it. It is especially important to study the homework solutions.</p>
PROJECTS	<p>There will be four small “projects. Three will involve assessing the recent history, current usage, and physics-related potential of an alternative energy source: hydroelectric power, wind power, and solar power. The first will be a “warm up” on graphing. These can be done in groups of up to three students.</p>
EXAMS	<p>There will be one midterm exam, tentatively scheduled for April 29, and a final exam on 8:00 am Monday June 7. Exams will have a combination of multiple-choice and short-answer questions.</p>
GRADING	<p>The various grade components and their weights for the final grade are:</p> <ul style="list-style-type: none"> • <i>Post-class summaries: 6%</i> • <i>Reading Quizzes: 14%</i> • <i>Quizzes: 15%</i> • <i>Homework Assignments: 13%</i> • <i>Projects: 14%</i> • <i>Midterm Exam: 19%</i> • <i>Final Exam: 19%</i> <p>Overall Grade: A=89-100%; B=78-88.9%; C=67-77.9%; D=57-66.9%; F<57%.</p>

OTHER POLICIES

GUIDELINES FOR REMOTE CLASS PARTICIPATION	<p>Participate and Contribute: Students are expected to participate by sharing ideas and contributing to the collective learning environment. This entails preparing, following instructions, and engaging respectfully and thoughtfully with others.</p> <p>Use Proper Netiquette: Please use good “net etiquette”: Identify yourself with your real name. Respect the privacy of your classmates and what they share in class. Understand that we may disagree and that exposure to other people’s opinions is part of the learning experience. Good netiquette also means using humor or sarcasm carefully, remembering that non-verbal cues (such as facial expressions) are not always possible or clear in a remote context. In addition, your language should be free of profanity, appropriate for an academic context, and exhibit interest in and courtesy for others’</p>
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	<p>contributions. Be aware that typing in all capital letters indicates shouting.</p> <p>Interact Professionally: Our learning environment provides an opportunity to practice being professional and rigorous in our contributions. As much as possible, use correct spelling, grammar, and style for academic and professional work. Use discussions and activities as opportunities to practice the kind and quality of work expected for assignments. Moreover, seize the chance to learn from others and develop your interpersonal skills, such as mindful listening and awareness of one’s own tendencies (e.g. Do I contribute too much? Too little?).</p> <p>Expect and Respect Diversity: All classes at the University of Oregon welcome and respect diverse experiences, perspectives, and approaches.</p> <p>Help Everyone Learn: Our goal is to learn together by learning from one another. As we move forward learning during this challenging time, it is important that we work together and build on our strengths. Not everyone is savvy in remote learning, including your instructor, and this means we need to be patient with each other, identify ways we can assist others, and be open-minded to receiving help and advice from others. No one should hesitate to contact me to ask for assistance or offer suggestions that might help us learn better.</p> <p>Specific guidelines for best practices using Zoom:</p> <ol style="list-style-type: none"> 1. Please test your video and audio prior to joining a live class session. You can learn more about testing your audio and video by visiting the UO Service Portal. 2. Be on time when the meeting starts. It can be distracting to have participants join late. 3. All of us occasionally need to hide video, but know that seeing your faces is a joy to me and, I believe, enriches all of our learning. We relate better to seeing other humans! I value video on. 4. That said, please be mindful that others can see you and your surroundings if your video is on. Try to find a quiet setting without lots of noise or busy activities in the background. Please minimize distractions like eating or multitasking. 5. Use a microphone or speak closely to your computer microphone so that others can hear you. If you have video on, try to look at your camera, not the screen, when you are contributing. 6. Mute your audio when you are not actively contributing. When contributing, avoid making other noises such as typing or eating or having side conversations with others that might be present with you. 7. Use chat to pose questions or offer insights “on the side” while others are contributing. The chat can be read by all and should reflect a high standard of respect for our class community. 8. For help and troubleshooting with Zoom, visit the UO Service Portal.
ABSENCES	I realize that it is unavoidable that people will have to miss a few classes (for example, due to illness). It is primarily for this reason that I drop the lowest

	<p>quiz and homework scores, and re-scale the post-class notes scores (see above). I will not give “makeup” quizzes, etc. – the point of the above policies is to avoid the mess created by these sorts of ad-hoc arrangements.</p> <p>Exams. Students with a serious and well-documented reason for missing an exam should contact Prof. Parthasarathy.</p>
ACADEMIC INTEGRITY	<p>Students are expected to abide by university policies on academic honesty, avoiding unauthorized help on assignments and examinations, the use of sources without acknowledgment plagiarism, fabrication, and cheating of all types. The Student Conduct Code (https://dos.uoregon.edu/conduct) provides definitions of these terms and explanations of the university policy on the subject. I take academic misconduct very seriously, as it is disrespectful to your fellow students, your instructor, and society. I will report misconduct to the Office of Student Conduct and Community Standards—consequences can include failure of the course. On exams, if a technological glitch disrupts your performance, don’t panic. Take a photo to document the error message you’re receiving and then email Prof. Parthasarathy.</p>
HOW TO DO WELL IN THE COURSE	<p>Plan ahead and start early! This applies to everything in the course – homework, reading assignments, and general studying. It will be crucial to keep up with the course and not fall behind; later topics build on earlier ones. For a 4 credit course, the University’s expectation is that you’ll spend about 10 hours per week outside of class on coursework.¹</p> <p>Make use of resources. If you have questions about lectures, assignments, readings, or other matters, come to Prof. Parthasarathy’s or the GTFs’ office hours with questions! Also, we encourage communication by phone or email, though we may often reply that it’s more effective to chat in person, at office hours.</p> <p>The University’s Tutoring and Learning Center (TLC) provides math and writing support in addition to tutoring, study skills support, workshops, and more. For more information, see http://tlc.uoregon.edu/.</p> <p><i>Also: Sleep! Many studies show that sleeping helps memory and understanding.</i></p>
POLICY ON MISSED DEADLINES, SIGNIFICANT ABSENCES & INCOMPLETES	<p>Only the following unforeseen and uncontrollable emergency situations are acceptable excuses for missed deadlines:</p> <ul style="list-style-type: none"> • Documented serious illness/injury; • Documented death in the <i>immediate</i> family. <p>All of the following are unacceptable – note that they include “personal” as well as “technological” excuses:</p> <ul style="list-style-type: none"> • Special occasions (e.g. weddings, birthdays, anniversaries etc.).

¹ <https://blogs.uoregon.edu/uocc/files/2016/10/Credit-Hour-and-Student-Workload-Policies-2af13yr.pdf>

	<ul style="list-style-type: none"> • Work and school conflicts: “I had to work extra hours,” “I have a huge midterm tomorrow in another class...” • Couldn’t get to campus (alarm didn’t ring; missed the bus; etc.). (<i>Not relevant this term!</i>) • Being generally “busy” or having “a lot going on right now...” • Forgot or “mixed up” the assignment or due date. • No access to computer printer; assignment completed on computer is “missing,” was accidentally erased, or is inaccessible.
<p>STUDENTS WITH DISABILITIES</p>	<p>All of us at the University of Oregon are working to create inclusive learning environments. Please notify me if there are aspects of the instruction or design of this course that result in disability-related barriers to your participation. You are also encouraged to contact the Accessible Education Center at 541-346-1155 or uoaec@uoregon.edu.</p>
<p>CHANGES TO THE SYLLABUS</p>	<p>As the university community adjusts to teaching and learning remotely in the context of the COVID-19 pandemic, course requirements, deadlines, and grading percentages are subject to change. I will be mindful of the many impacts the unfolding events related to COVID-19 may be having on you. I encourage you to talk with me about what you are experiencing so we can work together to help you succeed in this course.</p>