

THE PHYSICS OF ENERGY AND THE ENVIRONMENT (PHYSICS 161) WINTER 2022	PROFESSOR RAGHUVeer PARTHASARATHY (Par-tha-sa-ra-thē) Office: 362 Willamette Hall EMAIL: raghu@uoregon.edu
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SYLLABUS

Welcome to “The Physics of Energy and the Environment!”

This syllabus contains a lot of information, mostly about different components of the course. I’m fond of having a variety of assignments and activities, to make the class more lively and also to help people learn. This has gone very well in the past – students like it, as do I – but it definitely requires a good amount of organization on everyone’s part.

– Prof. Parthasarathy

INSTRUCTORS AND LOGISTICAL INFORMATION

CLASS TIMES	TuTh 12:00 - 1:50 pm, McKenzie Hall Room 129 The Tuesday period and the first half of the Thursday period will be “normal” classes – lecture, activities, etc., and I expect everyone to attend (barring health issues, of course!) I plan to have the second half of the Thursday period (1:00-1:50 pm) be an open question/discussion time, similar to office hours – feel free to attend this part or not, as you prefer.
INSTRUCTOR	Professor Raghuvēer Parthasarathy (Par-tha-sa-ra-thē) Email: raghu@uoregon.edu Office: 362 Willamette Hall
TEACHING ASSISTANTS	This course has a graduate student teaching fellow (GTF): Andrew Lesak – Email: alesak@uoregon.edu
OFFICE HOURS	Professor Parthasarathy and the GTF will have weekly office hours: Prof. Parthasarathy: W 1:00-1:50 pm, Th 2:00-2:50 pm, Willamette 362 Andrew Lesak: Th 11:00-11:50am, Fr 12:00-12:50pm, Science Library B020 Make use of office hours! Even if you don’t have specific questions, feel free to drop by and chat. If you’d like Zoom office hours, please let us know – we can likely do this in parallel with regular office hours. <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. What do we use it for? Is our present rate of energy consumption sustainable? What are its consequences for the environment? How can we intelligently make decisions about energy issues?

We’ll explore these questions *quantitatively*, investigating the science behind energy use and putting “real numbers” into our characterization of it. Why? It’s easy to have good intentions about energy and the environment, but without quantitative analysis, good intentions alone can’t guide important decisions and can often do real harm.

Who are you? Being in this course, it’s likely that you care about issues regarding energy and the environment. 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. Energy: What is it?
2. Energy, Heat, and Thermodynamics
3. Transportation
4. Fossil Fuels and their Environmental Impacts
5. Renewable energy sources (a very brief look*)
6. The Science of Climate, and Climate Change

* We’ll only take a brief look at renewable energy (wind, solar, etc.), because it is important enough to warrant its own course, Physics 162. Many students who take 161 also take 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 influence energy use.
- Assess and interpret graphs and quantitative data.
- Understand the process by which science generates knowledge.

COURSE MATERIALS AND COMPONENTS

CANVAS	<p>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 livehelp.uoregon.edu</p> <p>If you face Internet access challenges: companies are offering free access during this challenging time. To learn more about options visit Information Services' web page on going remote.</p>
TEXTBOOK	<p>There is no required textbook. The lectures plus supplemental readings will be sufficient. (See also “Reading Quizzes.”) Possibly useful:</p> <ul style="list-style-type: none"> • <i>Energy and Human Ambitions on a Finite Planet</i>. Tom Murphy. eScholarship, University of California, 2021. Free online: https://escholarship.org/uc/item/9js5291m . <i>Note:</i> This is a remarkable and up-to-date book on understanding energy issues. Part I isn't really necessary, and has several parts that many people (including Prof. Parthasarathy) would disagree with; I strongly recommend reading this review of the book: https://aapt.scitation.org/doi/full/10.1119/5.0062183 . • <i>Energy, Environment, and Climate</i> by Richard Wolfson – a very good book on these topics. A copy can be placed on reserve at the Science Library – please email Prof. Parthasarathy if you'd like this. • 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	<p>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.</p>
READING QUIZZES	<p>Reading assignments will precede many classes and will often have required “reading quizzes” associated with them. Each student's lowest reading quiz score will be dropped from the overall total.</p>
QUIZZES	<p>There will 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.</p>

HOMEWORK	<p>There will be homework assignments approximately every week. Feel free 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 problem set solutions.</p>
POST-CLASS NOTES	<p>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 (less than 300 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 on-line, via Canvas. The notes will be graded on content (i.e. that they capture something important about the day's lessons) and clarity. We'll give examples of good and bad notes.</p> <p>I realize that it is unavoidable that people will have to miss a few classes (for example, due to illness). Therefore, I will rescale the grades of the post-class notes 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%.)</p>
POLL QUESTIONS	<p>There will be in-class poll questions related to the present topic, scored by participation only, not the accuracy of the response. I intend to set this up using "Poll Everywhere," and I will discuss this in class. You'll need a phone or computer to respond to the polls. If you don't have a device like this, please let Prof. Parthasarathy know; there are alternatives.</p> <p>Poll points cannot be made up. However, I realize that absences are unavoidable, and so I will rescale the scores so that 90% counts as 100%; i.e. you can miss 10% of the questions without penalty.</p> <p>Please note: I haven't used Poll Everywhere before. There may be challenges in tabulating responses or dealing with Covid-induced absences. I might drop the participation grade if it seems too burdensome for students or for me!</p>
EXAMS	<p>There will be one midterm exam, tentatively scheduled for February 3, and a final exam on 8:00 am Friday March 18. Exams will have a combination of multiple-choice and short-answer questions. I realize the timing of the final exam (set by the Registrar – a https://registrar.uoregon.edu/calendars/examinations) may be inconvenient, and I may set this up as an online exam.</p>

GRADING	<p>The various grade components and their weights for the final grade are:</p> <ul style="list-style-type: none"> • <i>Quizzes: 16%</i> • <i>Reading Quizzes: 17%</i> • <i>Homework Assignments: 17%</i> • <i>Post-class summaries: 8%</i> • <i>Poll participation: 4%</i> • <i>Midterm Exam: 19%</i> • <i>Final Exam: 19%</i> <p>Overall Grade: A=90-100%; B=80-89.9%; C=70-79.9%; D=60-69.9%; F<60%.</p>
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OTHER POLICIES

ABSENCES	<p>I will not give “makeup” quizzes, etc. As noted above, I’ll drop the lowest quiz score, etc., and rescale participation scores to allow 10% absences – these will help offset any short-term absences. One of the aims of this policy to avoid the unsatisfying messes created by attempting to give “makeups,” which are never really equivalent to the originals.</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</p>

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

	<p>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>
<p>POLICY ON MISSED DEADLINES, SIGNIFICANT ABSENCES & INCOMPLETES</p>	<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.). • 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>