

THE PHYSICS OF ENERGY AND THE ENVIRONMENT (PHYSICS 161) WINTER 2023	PROFESSOR RAGHUEER 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 livelier 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, Willamette Hall Room 100 The Tuesday period and the first half of the Thursday period will be “normal” classes – lecture, activities, etc., and I expect everyone to attend (if healthy, 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 Raghueer Parthasarathy (Par-tha-sa-ra-thē) <i>Email:</i> raghu@uoregon.edu Office: 362 Willamette Hall
TEACHING ASSISTANTS	This course has a graduate student teaching fellow (GTF): Marija Glisic – <i>Email:</i> mglisic@uoregon.edu Office: 410 Willamette Hall
OFFICE HOURS	Professor Parthasarathy and the GTF will have weekly office hours: Prof. Parthasarathy: Tu 10:30-11:20am, Th 2:00-2:50pm, 362 Willamette Hall Marija Glisic: M 1:00-1:50 pm, Fr 12:00-12:50 pm, 410 Willamette Hall Make use of office hours! Even if you don’t have specific questions, feel free to drop by. <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 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. <i>Suggested:</i> Cc the GTF on emails.

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. Transportation
3. Energy, Heat, and Thermodynamics
4. Fossil Fuels and their Environmental Impacts
5. Renewable energy sources (a very brief look*)
6. The Science of Climate, and Climate Change

* Renewable energy (wind, solar, etc.) 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

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

TEXTBOOK

There is no required textbook. The lectures plus supplemental readings will be sufficient. (See also “Reading Quizzes.”) Possibly useful:

- We'll use parts of *Sustainable Energy – Without the Hot Air* by David MacKay, a remarkable book that quantifies a lot of energy-related issues.

	<p>It's available free online, at http://www.withouthotair.com/ .</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 recent book on understanding energy. Part I isn't necessary and has several parts that many people (including me) would disagree with; I recommend 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.
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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 many classes and will often have required "reading quizzes" associated with them. Each student's lowest two reading quiz scores will be dropped from the overall total.
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 dropped quiz.
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 important to study the homework solutions.</p>
POST-CLASS NOTES	Briefly reviewing what one learned from a class session helps cement one's understanding. By 5pm the day after each class , submit via Canvas a short (less than 300 words) summary of the key points of that day's class. Notes will be graded on content and clarity. We'll give examples of good and bad notes.

	<p>You can also ask questions and describe things that were unclear or that might benefit from additional explanation.</p> <p>To account for absences (e.g. due to illness) 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%.)</p>
POLL QUESTIONS / PARTICIPATION	<p>There will be in-class poll questions related to the present topic, scored by participation only, not the accuracy of the response. I will 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 me know; there are alternatives.</p> <p>The Poll Everywhere link for the course is https://pollev.com/raghuveerparthasarathy489 The URL is always the same, so you may want to bookmark it. Be sure to use your UO DuckID as your name for the polls to receive participation points! (Your DuckID is the thing before @uoregon.edu in your UO email address.)</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>
EXAMS	<p>There will be one midterm exam and a final exam. Exams will have a combination of multiple-choice and short-answer questions.</p> <p>Tentative midterm exam date: February 9</p> <p>Final exam: 8:00 am Monday, March 20. I realize the timing of the final exam is not ideal; it's set by the Registrar, not me – https://registrar.uoregon.edu/calendars/examinations.</p>
GRADING	<p>Note that various low scores will be dropped; see the items above.</p> <p>The weights of the grade components for the overall course 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>

OTHER POLICIES

ABSENCES AND ATTENDANCE	<p>We follow the university's policies, as described at https://provost.uoregon.edu/course-attendance-and-engagement-policy. Please note the "reason neutral" absence policy: instructors "shall not ask for reasons for absences and shall not distinguish between 'excused' and 'unexcused' absences."</p>
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	<p>Attendance is not recorded, but participation points, quizzes, and exams are only implemented in class.</p> <p>I will not give “makeup” quizzes, etc. As noted above, I’ll drop the lowest quiz score, etc., and rescale participation scores – these will help offset absences. One of the aims of this policy to avoid the unsatisfying messes created by “makeups,” which are never equivalent to the originals.</p> <p>Please contact Prof. Parthasarathy if you have University-sponsored events that will require you to miss class.</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.</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 (https://blogs.uoregon.edu/uocc/files/2016/10/Credit-Hour-and-Student-Workload-Policies-2af13yr.pdf).</p> <p>Make use of resources. If you have questions about anything, come to Prof. Parthasarathy’s or the GTF’s office hours! Communication by email is also welcome, though it’s often more effective to chat in person.</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>
STUDENTS WITH DISABILITIES	<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 uoacc@uoregon.edu.</p>
CHANGES TO THE SYLLABUS	<p>Course requirements, deadlines, and grading percentages are subject to change, but I will announce any changes in advance of any deadlines.</p>