

THE PHYSICS OF ENERGY AND THE ENVIRONMENT (PHYSICS 161) WINTER 2017	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 is a rather long syllabus – it has a lot of detail on many components of the course that we’ve constructed to help you learn things, and to make the term run smoothly and enjoyably. Don’t memorize it, but do **read it**. – Prof. Parthasarathy*

INSTRUCTORS AND LOGISTICAL INFORMATION

CLASS TIMES	TuTh 12:00-1:50 pm, Willamette 110
INSTRUCTOR	Professor Raghuvēer Parthasarathy (Par-tha-sa-ra-thē) Office: 362 Willamette Hall, Email: raghu@uoregon.edu
TEACHING ASSISTANTS	This course has a graduate student teaching fellow (GTF): <u>Edouard (Teddy) Hay</u> , edouardh@uoregon.edu
OFFICE HOURS	Prof. Parthasarathy: Tu 10:00-10:50am, Th 2:00-2:50pm, Willamette 362 Teddy Hay: Tu 2:00-2:50pm and Fr 12:00-12:50pm, Willamette 354C. <i>Office hour times may change, both by request (if particular times are not good for many students) and due to scheduling conflicts that arise.</i> Make use of office hours! Even if you don’t have specific questions, feel free to drop by and chat about course topics.
EMAIL	Email: You can certainly ask questions of me and the teaching assistants by email. I usually respond within 24 hours; I rarely respond to emails that begin “Hey...” or are otherwise poorly constructed.

COURSE DESCRIPTION AND MATERIALS

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? By enrolling in this course, I'm assuming it's likely that you care about issues regarding energy and the environment. By being university students, I'm assuming 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** – there are no science-course prerequisites, 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!

<p>LEARNING OUTCOMES</p>	<p>Students completing the course will have enhanced their abilities to:</p> <ul style="list-style-type: none"> • Understand how physical principles influence energy use. • Assess and interpret graphs and quantitative data. • Understand the process by which science generates knowledge.
<p>TEXTBOOK</p>	<p>There is no required textbook for the course. The lectures plus supplemental readings will be sufficient. (See also “Reading Quizzes.”) Possibly useful:</p> <ul style="list-style-type: none"> • <i>Energy, Environment, and Climate</i> by Richard Wolfson – a very good book on these topics. A copy is on reserve at the Science Library. • 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/.
<p>CLICKERS</p> 	<p>We'll use “iclickers,” personal response systems that allow polling and assessment in class. There is a participation grade associated with the clickers, described further in the grading section. Each student needs one clicker. Clickers can be purchased at the bookstore. Borrowing a clicker from someone not enrolled in this course <u>will</u> work fine.</p> <p>Clicker registration: We'll do this through Canvas, using the “iclicker” menu item at the left of the course page. Don't use iclicker.com!</p>
<p>CANVAS</p>	<p>We will be using Canvas in this course to distribute course materials, and also for online assignments. URL: https://canvas.uoregon.edu/</p>

ASSIGNMENTS AND ASSESSMENTS

READING QUIZZES	Reading assignments will precede many classes and will often have required “reading quizzes” associated with them. These will be answered in-class, usually via clickers or scantron forms.
QUIZZES	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 as we progress without the heavy weight of a “real” 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	<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 mainly be submitted online, via Canvas. Solutions to all the problem sets 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. (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 (about 100 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.</p> <p>Grading: 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. Because of the size of the class, we can’t grade everyone’s notes. We will somewhat randomly select ¼ of each set of submissions to grade, the “somewhat” meaning that we’ll make sure that everyone gets evaluated a roughly equal number of times.</p>
CLICKER Q’S	<p>There will be in-class “clicker” questions related to the present topic, scored by <i>participation only</i>, not the accuracy of the response.</p> <p>Overall score. Clicker points cannot be made up. However, I realize that absences are unavoidable, and so I will rescale the clicker scores so that 90% counts as 100%; i.e. you can miss 10% of the clicker questions without penalty.</p>
EXAMS	There will be one midterm exam, tentatively scheduled for Feb. 2 (Week 4), and a final exam on Monday, March 20, 8:00-10:00 am. (<i>Note that I</i>

	<p><i>don't get to choose the Final Exam date or time! The registrar's office schedules this.)</i></p> <p>We'll discuss the format later in the term; in brief, they will have a combination of multiple-choice and short-answer questions.</p> <p>Absences. Students with a serious and well-documented reason for missing an exam should contact Prof. Parthasarathy.</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: 15%</i> • <i>Clicker (participation): 4%</i> • <i>Homework Assignments: 16%</i> • <i>Post-class summaries: 10%</i> • <i>Midterm Exam: 18%</i> • <i>Final Exam: 21%</i> <p>Overall Grade: A=88-100%; B=76-87.9%; C=64-75.9%; D=52-63.9%; F<52%.</p>
ABSENCES	<p>I realize that it is unavoidable that people will have to miss a few classes (e.g. due to illness). Therefore I will rescale the grades of the post-class notes and clicker questions 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%.) I will not allow "makeup" quizzes, etc. – the point of this policy is to avoid the messes created by these sorts of ad-hoc arrangements.</p>
<p>LAPTOPS IN CLASS</p> <p><u>The use of laptop computers in class is not allowed.</u> Why? Several studies, plus past experience, show that students using laptops in class spend a lot of time on non-class-related activities (Facebook, games, ...) and that these distractions negatively impact both learning and grades. This alone isn't a reason to ban laptops – you're responsible for your own performance. <i>In addition</i>, however, studies have shown that non-class-related laptop use distracts and impacts the learning of <i>other students nearby</i>. (E.g. Fried, C. B. <i>Computers & Education</i> 50, 906-914 (2008).) Plus, <i>students</i> have complained to me about the environment created by their classmates' laptop use. (Taking notes by hand, by the way, is more effective in cementing concepts in your mind.)</p> <p>In summary, laptops are not allowed in class. The only exceptions will be for people with documented medical needs; please see me if this is the case.</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>

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

	<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 Teaching and Learning Center (TLC) provides a variety of workshops, writing assistance, and more to assist UO students. 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>NECESSARY CAVEATS</p>	<p>Students are expected to abide by university policies on academic honesty, avoiding plagiarism, fabrication, cheating, and academic misconduct. The Student Conduct Code (http://conduct.uoregon.edu/) provides definitions of these terms and explanations of the university policy on the subject. The UO Library also provides a guide to avoiding plagiarism (http://libweb.uoregon.edu/guides/plagiarism/students/). You are responsible for understanding these regulations and abiding by them. Students should be particularly careful to avoid plagiarism in out-of-class assignments, as well as projects and exams. Academic dishonesty will be dealt with severely, as it is disrespectful to your fellow students and your instructor, as well as being against both university regulations and state laws.</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.). • Being generally “busy” or having “a lot going on right now...” • Forgot or “mixed up” the assignment or due date. • No access to computer or printer; assignment completed on computer is “missing,” was accidentally erased, or is inaccessible.
<p>STUDENTS WITH DISABILITIES</p>	<p>If aspects of the instruction or design of this course result in barriers to your inclusion, please notify me as soon as possible. You are also welcome to contact Disability Services in 164 Oregon Hall, 346-1155.</p>