

Prof. Raghuv​eer Parthasarathy  
 Dept. of Physics; Univ. of Oregon  
 Winter 2016

**Physics 161 – Physics of Energy and the Environment**  
**SYLLABUS**

<b>INSTRUCTOR</b>	<b>Professor Raghuv​eer Parthasarathy</b> (Par-tha-sa-ra-thē) Office: 362 Willamette Hall, Email: <a href="mailto:raghu@uoregon.edu">raghu@uoregon.edu</a>
<b>CLASS TIMES</b>	TuTh 12:00-1:50 pm, Willamette 110 <i>Attendance is not required, but is very strongly recommended.</i>
<b>TEACHING ASSISTANTS</b>	This course has a graduate student teaching fellow (GTF) <i>and</i> an undergraduate assistant! <ul style="list-style-type: none"> <li>• <a href="mailto:salexand@uoregon.edu">Spencer Alexander</a>, salexand@uoregon.edu</li> <li>• <a href="mailto:elijahm@uoregon.edu">Eli Meyer (undergraduate)</a>, elijahm@uoregon.edu</li> </ul> Spencer is supported by UO’s Science Literacy Program (SLP) (scilit.uoregon.edu), which aims to develop new & better general-education science courses. Eli is an undergraduate physics major, supported by the SLP.
<b>OFFICE HOURS</b>	<b>Make use of office hours!</b> Even if you don’t have specific questions about homework, feel free to drop by and chat about course topics. <ul style="list-style-type: none"> <li>• Prof. Parthasarathy: Wednesday 1:00-1:50pm, Thursday 2:00-2:50pm; Willamette 362.</li> <li>• Spencer Alexander: Tuesday 2:00-2:50pm and Friday 11:00-11:50am; Willamette 155.</li> </ul> Please note that <i>office hour times may change</i> , both by request (if particular times are not good for many students) and due to scheduling conflicts of the instructors (e.g. travel).
<b>TOPICS AND AIMS</b> <p>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?</p> <p>We’ll explore these questions <i>quantitatively</i>, 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.</p>	

*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!

<b>LEARNING OUTCOMES</b>	Students completing the course will have enhanced their abilities to: <ul style="list-style-type: none"> <li>• Understand how physical principles influence energy use.</li> <li>• Assess and interpret graphs and quantitative data.</li> <li>• Understand the process by which science generates knowledge.</li> </ul>
<b>TEXTBOOK</b>	<ul style="list-style-type: none"> <li>• There is no required textbook for the course. The lectures plus supplemental readings supplied via Canvas will be sufficient.</li> <li>• <i>Energy, Environment, and Climate</i> by Richard Wolfson is recommended – it's a very good, recent book on these topics. I've placed a copy on reserve at the Science Library, and can add another if needed.</li> <li>• We'll also 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. The book is available <b>free</b> online, at <a href="http://www.withouthotair.com/">http://www.withouthotair.com/</a>.</li> </ul>
<b>CANVAS</b>	We will be using Canvas in this course to distribute course materials, and also for online assignments. URL: <a href="https://canvas.uoregon.edu/">https://canvas.uoregon.edu/</a>
<b>HOMEWORK</b>	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 – <b>study</b> these. <u>No late homework will be accepted.</u>

	<p>Some assignments will involve finding and analyzing data. You should be able to navigate the internet and make simple 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>
<b>POP. SCIENCE ARTICLES</b>	I'll assign various "popular" science articles and ask you to analyze and comment on them. These assignments will be described further as the term progresses.
<b>QUIZZES</b>	There will be about 5 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.
<b>CLICKERS</b>	<p>We'll use "iclickers," personal response systems that allow real-time 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, which looks like this:</p>  <p>Clickers can be purchased at the bookstore. Borrowing a clicker from someone <i>not</i> enrolled in this course <u>will</u> work fine.</p> <p><b>Clicker registration:</b> We'll do this through Canvas – details TBA; <b>don't</b> use iclicker.com!</p> <p><b>Overall score.</b> 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</p>
<b>GRADING</b>	<p>The various grade components and their weights for the final grade are:</p> <ul style="list-style-type: none"> <li>• <i>Homework Assignments: 20%</i></li> <li>• <i>Quizzes: 15%</i></li> <li>• <i>Popular Science Article Assignments: 12%</i></li> <li>• <i>Clicker (participation): 3%</i></li> <li>• <i>Midterm Exam #1 (probably Feb. 11, week 6): 20%</i></li> <li>• <i>Midterm Exam #2 (probably March 13, week 10): 15%</i></li> <li>• <i>Final Project (due Wed. March 16, by 5pm): 15%</i></li> </ul> <p><b>Overall Grade:</b> A=88-100%; B=76-87.9%; C=64-75.9%; D=52-63.9%; F&lt;52%.</p>

	<b>Absences.</b> Students with a serious and well-documented reason for missing an exam should contact Prof. Parthasarathy to discuss accommodations.
<b>EMAIL</b>	<b>Email:</b> 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.
<p><b>LAPTOPS IN CLASS</b></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 great deal of time on non-class-related activities (surfing the web, playing 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 in class. <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 &amp; Education</i> <b>50</b>, 906-914 (2008).) Plus, <i>students</i> have complained to me about the environment created by their classmates’ laptop use.</p> <p>Taking notes by hand, by the way, is more effective in cementing concepts in your mind. (Note, by the way, that lecture slides are posted online, so you don’t have to frantically transcribe everything anyway.)</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>	
<b>HOW TO DO WELL IN THE COURSE</b>	<ul style="list-style-type: none"> <li>• Attend class.</li> <li>• Do the homework, and study the solutions.</li> <li>• Work on understanding all the concepts and example questions discussed in the lectures and the homework. “Understanding” does <i>not</i> mean “it sounds like it makes sense to me,” but more deeply, “I could explain this concept to one of my classmates.”</li> <li>• Come to my or the GTF’s office hours with questions!</li> <li>• <b><i>Sleep!</i></b> <i>Many studies show that sleeping helps both memory and understanding.</i></li> </ul>
<b>STUDENTS WITH DISABILITIES</b>	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.