

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

Physics 162 – Physics of Solar and Renewable Energies

SYLLABUS

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| INSTRUCTOR | Professor Raghuv​eer Parthasarathy (Par-tha-sa-ra-thē) Office: 362 Willamette Hall, Email: ragbu@uoregon.edu |
| CLASS TIMES | TuTh 2:00-3:50 pm, Willamette 110 <i>Attendance is not required, but is very strongly recommended.</i> |
| TEACHING ASSISTANTS | Graduate student teaching fellow (GTF): <ul style="list-style-type: none"> • Herbie Grotewohl, hgrotewo@uoregon.edu@uoregon.edu |
| OFFICE HOURS | Make use of office hours! 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"> • Prof. Parthasarathy: Tuesday and Thursday 11:00-11:50am, Willamette 362. • Herbie Grotewohl: Thursday 4:00-4:50, Willamette 240D. Note: <i>office hour times may change</i> , both by request (if particular times are bad for many students) and due to scheduling conflicts of the instructors (e.g. travel). <i>You're strongly encouraged to come to office hours, either with specific course-related questions, or just to chat about physics, science, and other general topics.</i> |
| 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. |
| TEXTBOOK | <ul style="list-style-type: none"> • There is no required textbook for the course. The lectures plus supplemental readings supplied via Canvas will be sufficient. • <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. 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 free online, at http://www.withouthotair.com/ . |

TOPICS AND AIMS

Modern civilization uses vast amounts of energy in forms that are unsustainable and environmentally damaging. What are our alternatives? Can they meet our needs?

We'll explore these issues, and will do so *quantitatively*, investigating the physics behind various energy sources. Why? It's easy to have good intentions about energy and the environment, but without quantitative analysis, good intentions alone are insufficient for guiding 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 energy issues. 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.

We'll examine a variety of topics:

1. Present energy usage and sources
2. Energy: What is it?
3. Fossil Fuels and their environmental impacts, including climate change (Brief*)
4. Solar energy
5. Wind, wave, and geothermal energy sources
6. Biomass
7. Energy storage
8. Energy conservation
9. Geoengineering and other tactics for dealing with climate change

* Fossil fuels and Climate Change 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!

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| LEARNING OUTCOMES | Students completing the course will have enhanced their abilities to: <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. |
| CANVAS | We will be using Canvas in this course to distribute course materials, and also for online assignments. URL: https://canvas.uoregon.edu/ |
| HOMEWORK | 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> Some assignments will involve finding and analyzing data. You should be able to navigate the internet and make simple graphs (e.g. with Excel). <i>Homework grading:</i> |

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| | <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> |
| QUIZZES | <p>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.</p> |
| POP. SCIENCE ARTICLES | <p>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.</p> |
| CLICKERS | <p>We'll use "clickers," 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>Clicker registration: We'll do this through Canvas – details TBA; don't use iclicker.com!</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</p> |
| GRADING | <p>The various grade components and their weights for the final grade are:</p> <ul style="list-style-type: none"> • <i>Homework Assignments:</i> 20% • <i>Quizzes:</i> 23% • <i>Popular Science Article Assignments:</i> 12% • <i>Clicker (participation):</i> 5% • <i>Midterm Exam</i> (probably April 28): 20% • <i>Final Exam</i> (8:00am Thursday, June 9): 20% <p>Overall Grade: A=88-100%; B=76-87.9%; C=64-75.9%; D=52-63.9%; F<52%.</p> <p>Absences. Students with a serious and well-documented reason for missing an exam should contact Prof. Parthasarathy to discuss accommodations.</p> |

LAPTOPS IN CLASS

The use of laptop computers in class is not allowed. 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. *In addition*, however, studies have shown that non-class-related laptop use distracts and impacts the learning of *other students nearby*. (E.g. Fried, C. B. *Computers & Education* **50**, 906-914 (2008).) Plus, *students* 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. (Note, by the way, that lecture slides are posted online, so you don't have to frantically transcribe everything anyway.)

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.

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| HOW TO DO WELL IN THE COURSE | <ul style="list-style-type: none">• Attend class.• Do the homework, and study the solutions.• 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.”• Come to my or the GTFs' office hours with questions!• <i>Another suggestion: Sleep! Numerous studies show that sleeping helps both memory and understanding.</i> |
| STUDENTS WITH DISABILITIES | 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. |