



Syllabus – PHYS 102 Energy and Society – Spring 2015

Course Information:

PHYS 102:	Energy and Society, 4 credits, Spring 2015
Lecture Time:	Tuesday/Thursday, 11:30 AM-1:00 PM
Lecture Location:	Paul B. Reichardt (REIC) 138
Lab Time:	Wednesday, 2:15-5:15 PM
Lab Location:	REIC 252
Prerequisites:	Basic algebra

Instructor Information:

Instructor:	Peter Delamere, Associate Professor of Space Physics
Office:	708E Elvey (Geophysical Institute); 108 (REIC)
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Office Hours:	Tuesday, 10:30-11:30; Wednesday, 1:00-2:00, or by appointment

Scope: Energy pervades all aspects of society. Energy is a relatively simple physical concept and we can probably agree through physical experience that work requires energy. Work can be performed through human power, by a complex machine fueled by gasoline, or by a simple wind-powered turbine that generates electricity. The ability to do work affects our lifestyle (e.g. warm homes, convenient transportation, easy-to-use home appliances etc.), our economy (e.g. converting raw materials into useful products for consumers), our politics, and our natural environment. This course will explore basic physical concepts so that we can explore energy consumption in an industrial society and consider the environmental consequences.

Approach: Energy and Society is intended for students having little or no background in science or mathematics. Energy production and the variety of machines used to do work bridge many aspects of physics. Our goal is to use energy as a vehicle for understanding many basic physical concepts found in an introductory physics course while keeping the math manageable and improving math skills. Students will learn how to convert physical units (e.g. miles to kilometers or gallons of heating fuel to therms of natural gas) so that we can directly compare different forms of energy (e.g. electricity vs. gasoline). Armed with these quantitative tools, we will discuss the social, political, and economics aspects of energy, and debate the energy future and environmental impact of energy consumption.

Topics: We will examine fossil fuels, heat engines (thermodynamics), renewable energy sources (e.g. solar, wind, hydropower, geothermal energy conversion, biomass, tidal energy), nuclear energy, energy conservation, transportation, air pollution (i.e. atmospheric physics), and global effects (e.g. climate change).

Textbook: *Energy and the Environment (2nd Edition)*, R. Ristinen and J. Kraushaar. Supplementary material will be provided in class lecture where information in the textbook is out of date.

Homework: Homework will be due at **5:00 p.m. on Thursdays**. Place your homework in the appropriate box in the Physics Department office. You are encouraged to work with other students on your homework, but the final written solutions must be your own. Solutions to the homework assignments will be posted on UAF Blackboard every Thursday at 5:00 p.m. Late homework, therefore, will not be accepted.

Lab: The laboratory component is required. The purpose of the lab is to provide hands-on experiences with course material. At least 10 of the 12 labs and reports must be completed to get a passing grade for the lab. A PASSING GRADE IN THE LAB IS NECESSARY TO PASS THE COURSE.

Lab	Date (Wednesday 2:15-5:15)
Lab 1: Introduction to laboratory methods	Jan 28
Lab 2: Simple Machines	Feb 4
Lab 3: Mechanical Energy Equivalent of Heat	Feb 11
Lab 4: DC Circuits, Part 1	Feb 18
Lab 5: DC Circuits, Part II	Feb 25
Lab 6: Photovoltaics	March 4
Lab 7: Radiation	March 11
Lab 8: Thermal Conductivity	March 25
Tour of CCHRC	April 1
Lab 9: Power House	April 8
UAF Power Plant Tour	April 15
Lab 10: Human Power	April 22
Make-up Labs	April 29

Project: The final project will be due at the end of the semester. This project will involve research on a topic of your choice and will culminate in a ~5 page paper and a 10-15 minute in-class oral presentation. The purpose of the project is to provide an opportunity to communicate the physics of energy to your peers and share a wide breadth of information with the class. Topics must be selected by **February 25**, and the in-class presentations will commence in the final two weeks of the semester.

Exams and Quizzes: Two midterm exams are scheduled. The first exam will cover (roughly) chapters 1-4, the second exam will cover chapters 1-8. The final exam will cover chapters 1-10. Expect weekly quizzes.

Grading:

Homework and Quizzes	20%
Lab:	15%
Project:	20%
Hour Exams:	10% (each)
Final Exam	25%

Course Policies:

- Attendance and participation in class is expected of all students.
- Homework is due at 5:00 p.m. in the dropbox in the physics department office.
- Students are encouraged to work together on homework problems, but the final written solutions must be individual work.
- Students must acknowledge all sources of information – included fellow students – used in homework solutions and final projects. The UAF catalog states: “The university may initiate disciplinary action and impose disciplinary sanctions against any student or student organization found responsible for committing, attempting to commit or intentionally assisting in the commission of . . . cheating, plagiarism, or other forms of academic dishonesty. . . .”
- All UA student academics and regulations are adhered to in this course. You may find these in the UAF catalog (section “Academics and Regulations”).

Schedule:

Topic	Dates
Energy Fundamentals	Jan 15, 20, 22, 27
Fossil Fuels	Jan 29, Feb 3
Heat Engines	Feb 5, 10
Solar Energy	Feb 12, 17, 19, 24
<i>Midterm Exam 1</i>	Feb 26
Alternatives	March 3, 5
Nuclear Energy	March 10, 12
<i>Spring Break (no classes)</i>	March 16-20
Energy Conservation	March 24, 26
Transportation	March 31, April 2
<i>Midterm Exam 2</i>	April 7
Air Pollution	April 9, 14
Global Effects	April 16, 21, 23
In-class presentations	April 28, 30
<i>Final Exam</i>	10:15 a.m.-12:15 p.m., Wednesday, May 6